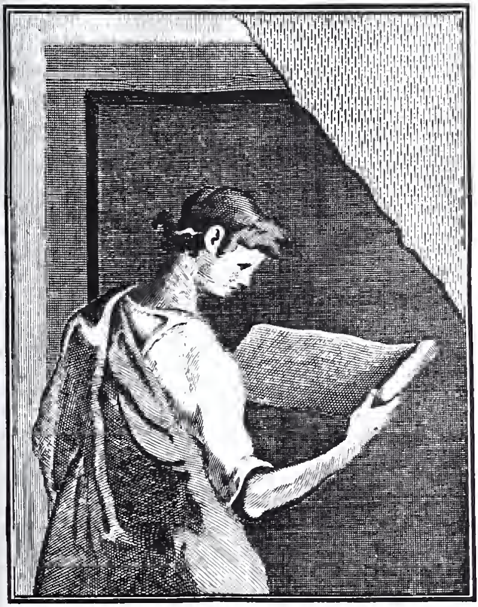

ANNUAL RECORD

OF

SCIENCE AND INDUSTRY

FOR 1871.

EDITED BY

SPENCER F. BAIRD,

WITH THE ASSISTANCE OF EMINENT MEN OF SCIENCE.

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PREFACE.

The design of the present work is to furnish a brief, yet sufficiently full, mention of the more important discoveries in the various departments of science during the year 1871, selecting, however, only such as appear likely to excite a general interest, or to be of lasting importance. The special student of Astronomy, of Chemistry, or of the physical sciences generally, of Natural History in any of its branches, etc., will, of course, not confine himself to the brief abstracts of a work like this. Such persons can only be satisfied with the publications devoted particularly to their several chosen departments of science, in the pages of which they may hope to be enabled to pursue their studies and investigations through all the minutest details of progress.

The very complete series of publications of learned societies, and of journals specially devoted to various branches of science, belonging to the Smithsonian Institution, have been kindly placed at the service of the editor by its Secretary. With the facilities thus furnished for surveying the field of science, with the aid, in addition, of numerous foreign and domestic scientific serials received by mail for use in this connection (enumerated at the end of the volume), the editor trusts that not much of a general interest or importance has been overlooked.

In providing for the general public, there is, of course, a great margin for varying tastes and judgment, and no two minds would probably agree exactly as to what should be selected and what omitted. In making his choice, the editor has endeavored to do proper justice to all the various subjects of scientific interest and research, and to neglect nothing of real interest, and he has endeavored not to allow his own partialities to influence him unduly in his se-

lections. How far he has succeeded he must leave others to judge. He may, however, be permitted to add—and justice to those, to whose friendly aid he owes so much, requires that he should do so—that in gathering material and in adapting it for the purposes in question, he has been so fortunate as to secure the assistance of some of the most eminent men of science of this country, some of whom have, in addition, furnished quite a number of original communications containing accounts of personal discoveries and observations.

In preparing the matter of the present volume, the design has been to furnish abstracts only, divesting the different subjects, as far as practicable, of mere technicalities, and omitting what was not properly relevant. In many instances, indeed, a single article has been made to embrace data from a number of different sources, while not unfrequently are included original ideas, unpublished elsewhere, and derived from personal investigation or supplied by collaboration as already mentioned. In very few cases has a literal copy of any article been made, and this only where farther condensation or other change appeared inexpedient.

A large portion of the contents of this volume has already appeared in the "Editor's Scientific Record" of Harper's Monthly, and the "Scientific Intelligence" of the Weekly; some of it also in the Philadelphia Public Ledger and elsewhere. It is here, however, arranged somewhat in systematic order for the benefit of special students, and more or less revised, and in book form, with the original references appended, as explained in the table on page 614. The remainder of the book, embracing material which could not be introduced into the journals referred to for want of space, is here presented for the first time.

Smithsonian Institution, Washington, *March* 1, 1872.

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GENERAL SUMMARY

OF

SCIENTIFIC AND INDUSTRIAL PROGRESS FOR THE YEAR 1871.

The year that has closed has not been remarkably fruitful in the way of great discoveries in science, although much progress has been made in filling out the gaps in our knowledge of many subjects. We propose here to take up the several departments in succession, and to indicate as briefly as possible what appears to be most worthy of note, especially so far as the United States is concerned.

The most interesting among the researches in *Astronomy* during the year have been those devoted to comets and the corona. The successful observation of four total eclipses in as many consecutive years is something without precedent in the history of Astronomy. The first eclipse, that of 1868, showed that the protuberances were composed mainly of hydrogen gas. The eclipse observed in this country in 1869 showed that the corona was at least in great part gaseous, but did not indicate that the gas was identical with any known terrestrial substance. Owing to the unfavorable weather which extended over the whole line of the eclipse of 1870 in the Mediterranean, little more was done on the corona than to confirm this discovery, and to show that the now celebrated "green line," by which the gas was indicated, extended to a distance of fifteen or twenty minutes from the sun—more than half the diameter of the latter. Perhaps the most important discovery made during this eclipse was one by Professor C. A. Young, who observed in Spain. At the instant of commencement of totality he saw all the dark lines of the fading spectrum he had been watching suddenly reversed, so as to show bright on a dark ground. This appearance lasted only one or two seconds. The conclusion drawn from this appearance is that the entire surface of the sun is covered with a thin layer or glowing atmosphere composed of the vapors of all the substances known to exist in the sun.

The accounts of the recent Indian eclipse (December 11, 1871) are as yet very meagre, and do not indicate that any thing has been done beyond confirming the former discoveries. It is said that the spectroscope has indicated the existence of water at a great height above the sun, but this was done by Professor Winlock, in Spain, in 1870. It is also said that the reversal of the bright lines seen by Professor Young has been confirmed.

Intimately connected with the question of the corona and protuberances is that of the temperature of the sun, to which an impulse has been given by the researches of Père Secchi. Starting from the observed rise of temperature produced by the solar rays, this eminent physicist computed that the temperature of the incandescent surface of the sun could not be less than 10,000,000 degrees! The French physicists, starting from the very same data, find a temperature of only a few thousand degrees—no higher, in fact, than what can be produced by artificial means at the surface of the earth. The difference arises from the difference of the supposed law of increase of radiation with the temperature. Père Secchi supposes the radiation to be exactly proportional to the temperature, an hypothesis contradicted by experiment; while the French start from the law of Dulong and Petit, which is founded on actual observations. They have, therefore, the best of the argument.

The return of two periodic comets, those of Encke and Tuttle, during the year, has led to a complete confirmation of the observations made in previous years with the spectroscope on other comets, namely, that these bodies give a spectrum of bright lines, like glowing gas, and very closely resembling that of olefiant gas. But no one has yet explained how a red-hot gas can move through the planetary spaces without either cooling off or expanding indefinitely by its own elastic force, so that, in fact, this discovery has left the exact nature of comets a greater mystery than ever. The spectroscope has also revealed atmospheres of great absorbing power around the planets Uranus and Neptune. It is not found possible to identify them with any known terrestrial substance, but it seems not unlikely that carbonic acid is an important constituent.

There is now some prospect that American astronomers

will take a prominent part in the observations of the transit of Venus which is to take place in 1874. In the winter of 1871 Congress authorized the formation of a commission to make the necessary arrangements, and expend any money that might be appropriated for this purpose. This commission consists of Admiral Sands and Professors Peirce, Henry, Newcomb, and Harkness. It only remains for Congress to furnish the requisite means for organizing the expeditions.

Meteorology, in its practical bearings, has been greatly advanced in the New World by the operations of the United States Signal Corps, under General Myer, this branch of the public service not limiting itself, as heretofore, to the collecting and reporting information by telegraph of the condition and changes of atmospheric phenomena in different parts of the country, but now furnishing, in addition, forecasts of the weather, which are intended to indicate the probabilities for the coming twenty-four hours. These predictions have proved to be singularly accurate, and are now greatly relied upon by all classes of the community for influencing the operations of the day. The announcements are made by telegraph to all parts of the country, and when any severe storm is anticipated, the fact is published by means of signals over the greater part of the sea-coast and lakes of the country. The operations of the same corps on the summit of Mount Washington during the past winter have tended to throw a great deal of light upon the condition and movements of the higher currents of air.

The Smithsonian Institution and the Medical Department of the United States Army have prosecuted their systems of meteorological observations during the year, the former also distributing a large number of rain-gauges, and the latter continuing to improve the character of the instruments.

The climatological condition of America during the year has exhibited certain marked peculiarities; among others, unusual prevalence of rain during the spring and summer on the west coast of South America, a region previously almost unacquainted with this phenomenon, and of deep snows in the Rocky Mountains of the United States in the ensuing winter.

The government meteorological establishments of Europe have also continued their system of operations, somewhat on the plan of that of the United States, but on a much small-

er scale respectively, and have aided in obtaining accurate generalizations in regard to the laws of meteorology. Among these results may be mentioned a work by Mr. Lay upon the law of the winds, which has excited much attention.

The science of *Terrestrial Physics* has been enriched by the papers upon ocean currents by Dr. Carpenter, Mr. James Croll, and others. The views of these gentlemen are, however, widely diverse in regard to the cause of this phenomenon, Dr. Carpenter taking the ground that the currents both of the Atlantic and of the Mediterranean are produced by a difference in the specific gravity of the different parts of the mass, while Mr. Croll believes that they result from the influence of the surface winds.

Pendulum experiments in India would seem to show that the density of the earth at the surface diminishes as we proceed farther from the shore to the higher elevations of the mountain ranges.

In the department of *Electricity* and *Magnetism* we have communications upon the action of electricity upon gases traversed by electric currents; on the origin of celestial positive electricity by Becquerel, who maintains that this proceeds from the sun, which, being emitted through the solar spots, and permeating all space, gives rise to such phenomena as the aurora, etc.

As far as concerns *Theoretical* and *Applied Chemistry*, important modifications in chemical notation and nomenclature have risen to vex chemists and trouble the declining years of the pioneers of the science. It is the fashion to make suggestions and introduce novelties in modern chemistry, and there is great need of a master mind like Lavoisier or Berzelius to systematize the language, and once more bring order out of chaos.

The time-saving element has entered here, and it is proposed, in the naming of chemical compounds, where formerly the adjective preceded the noun, to invent one word that would express the sense; thus, instead of the "sulphate of the protoxide of iron" or the "protosulphate of iron," it is proposed to substitute the expression "ferrous sulphate;" and where there are various oxygen compounds of an element, to employ suitable Latin terms, as ferrous, ferric, cuprous, cupric, etc.

In the writing of formula there is the same revolution, with this difference, that the artistic element has been brought into play, and a great variety of patterns now adorn our text-books. Graphic formula were originally inserted for abbreviation and perspicuity; they have now become voluminous, and as unintelligible as the ancient signs of the alchemist. If we were to define the characteristic features of the present state of chemical science we should undoubtedly say that it was the general tendency to synthetic methods.

This condition of things is the natural outgrowth of the discussions about atoms, molecules, types, and graphic formula. The chemist imagined certain reactions, and in many instances has had the happiness to see them confirmed. As soon as the way was pointed out, and the first barriers broken, the rush of chemists to the new fields of research was great, and at the present time how to create by synthesis occupies the majority of the leading investigators of the world.

Berzelius believed that chemical forces could not effect organic synthesis, and that when such changes occurred they were due to the agency of vital force. This theory was accepted as correct, and synthetical chemistry was very little studied; we now find it overthrown, and even the fats have been artificially prepared by Berthelot. Theoretical chemistry has therefore made great progress during the year, as the number of workers has been more numerous than ever before, and out of the theories advanced by chemists have grown important practical applications. The whole subject of bleaching, so happily founded by Berthollet, has undergone a great change. Instead of chlorine, oxygen is supposed to do the work, and this renders it possible to introduce new agents. Accordingly, we find the permanganate of potash, a compound rich in oxygen, actually largely employed for bleaching. Ozone also receives application for the same purpose, and diligent search is made for a cheap method of its preparation.

The natural corollary of bleaching is disinfecting, and here we observe the introduction of several new agents, the permanganate of potash, ozone, carbolic acid, and several metallic salts. In this connection we must not fail to mention the increased attention bestowed upon dry earth as a powerful fixative agent, and its introduction into closets out of sani-

tary and economical considerations. Until recently a substance originally known as an incrustation upon the sands in the vicinity of the Temple of Jupiter Ammon, and hence called *sal ammoniac*, was the principal source of the small amount of volatile alkali required in medicine and the arts. A great change has recently taken place in the commercial value of this article. Ammonia is now largely consumed in the artificial production of ice, as a motive power, as a fire extinguisher, as a fertilizer, and in numerous arts and industries. Its enormous production from gas-house liquors, from the spent vapors of the lagoons of Tuscany, from the residues of the refinery of Chilé saltpetre, from crude borax, and from volcanic incrustations, is one of the features of modern industry.

The study and practical application of the products derived from the distillation of coal, wood, and petroleum is still prosecuted with success, and so much literature has accumulated in this branch of chemistry that a systematic and classified list is greatly to be desired. The aniline industry has increased in proportion, and we have new artificial colors to be added each year. Artificial alizarine would seem to be an accomplished fact, and the only vegetable dye which remains for the chemist to imitate is indigo. Carbolic acid, paraffine, and glycerine are becoming familiar to every body, and their uses have been greatly extended during the year.

We have not the space to enumerate all that has been discovered in coal-tar and petroleum, and must content ourselves with the above reference to this branch of industry.

In the working of ores and metals many changes have been introduced, and metals which for their rarity and cost were formerly classed among the luxuries, are now of common use, and great aids to the comforts of civilization. Among these we may count the common production and use of zinc; the increased production of aluminium and magnesium; the cheapening of iron and steel by the Bessemer process; the free use of nickel for plating; the appearance of manganese upon the stage to be alloyed with copper, and the cheap manufacture of sodium as compared with former prices. The disintegration of lead ores by zinc has been developed and applied within a recent period. In all metallurgical operations there has been hitherto a serious waste in the accumulations of the flues and in the slags. Much of this loss is

now done away with by a reconstruction of the chimney-stacks, by modifications in the form of the furnace, and by the use of the slags for many purposes. There have been few instances of progress of more importance than the management of cinders and slags as now conducted in Europe. What was formerly thrown away is now sold at a profit, and a corresponding deduction in the cost of metals has been effected.

In the United States the manufacture of cryolite glass bids fair to become of considerable importance. The material made from cryolite is found to possess many advantages over porcelain, especially for the use of the photographer, and the demand for articles made according to the new process is said to be greater than the supply. The use of albumen as a substitute for blood in the refining of sugar is an improvement worthy of note, and has occasioned an increased demand for the raw material. Albumen is now extensively made from blood, fish-roe and wild birds' eggs, and in Alsatia hens' eggs are in great demand. The sugar refiner, the photographer, and the aniline dyer consume unprecedented quantities of albumen at the present time.

Nitro-glycerine has been modified in its physical form by the introduction of the explosives called dynamite and dualin, which are less dangerous in their transportation, while being quite as effective in execution. The manufacture of oxygen on a commercial scale can hardly be pronounced a success, even at this late day. The three leading methods now employed use the atmosphere as the source of supply, and employ manganese and soda, or chloride of copper, or water, as the agents by which the oxygen is detained and subsequently collected for use. The direct manufacture of chlorine from hydrochloric acid, as accomplished in England, is a step in advance of rare value. It will reduce the cost of bleaching powders, and, as a consequence, give us our clothing, our paper, and our books at a much lower rate, and is consequently very properly regarded as one of the most important technical improvements of the year.

The interests of humanity have been promoted by the introduction of condensed food, and new articles of diet, the invention of which was a growth of the late disastrous war in France. There has not been sufficient time for all of the im-

provements to be made known, but we shall in the end find ourselves richer for the hard labor of the French chemists during their time of need. A marked change has taken place in the source of potash, iodine, and bromine. The Stassfurt mines now yield the greater part of the potash and bromine salts required by the world, and the Chilé saltpetre appears likely to compete with sea-weed as a store-house for the extraction of iodine.

Such are some of the most notable indications of progress in the department of Chemistry, the details of which will be found embodied, in a greater or less degree, in our annual report for the year.

In the departments of *Geology* and *Mineralogy* the principal progress in America has been in the way of information respecting the geology of particular sections of the country by the publication of various reports, such as the explorations of Clarence King, Dr. Hayden, Professor Marsh, and others, prosecuted over a wide range of country; by the reports of geologists of certain states, as those of Michigan, Ohio, New Jersey, etc.

From Dr. Hayden we have a detailed report of operations in Wyoming Territory, and partial accounts, to be completed hereafter, of the structure of the wonderful regions in the vicinity of the head waters of the Yellowstone, where, in an area of about fifty by sixty miles, we have one of the most remarkable exhibitions of hot springs, geysers, mud volcanoes, etc., to be found on the face of the globe.

Papers by Dr. T. Sterry Hunt on the geognosy of the Appalachians and the origin of crystalline rocks; by Professor Dana on the glacial system of the New England States and Canada; accounts of the geology of the diamond fields in Africa, and new views in regard to the geology of New Zealand, are all in the list of communications for the year.

The visit of the Swedish expedition to Greenland for the purpose of bringing back a large number of meteorites has been crowned with success, and a number were brought home, one of them of the enormous weight of over 40,000 pounds. Unfortunately, these giant specimens have been found very difficult of preservation, exposure to the air of cities seeming to cause them to crumble into fragments, and to render futile all means employed to prevent their entire disintegration.

The *Geographical* inquiry during the year has been largely directed to the north polar region, and the well-appointed American expedition under Captain Hall may be considered as taking the lead in point of prominence. Accompanied by Dr. Bessels, of Heidelberg, an experienced arctic explorer, as the chief of the scientific branch of the expedition, Captain Hall left the United States in July last provided with every appliance that could be thought of for facilitating the object of his mission. The latest advices from Greenland showed that the whole party was in good spirits and emulous to solve the problem of polar search. The autumn of 1872 will probably bring us word as to the actual results.

Another important expedition, in its indications of future successes, was that of the *Ice-Bear*, under Messrs. Payer and Weyprecht. These gentlemen, in a small vessel of only sixty tons, succeeded in penetrating to a high northern latitude, and in finding a sea free from ice as far as the eye could reach. They were apparently only prevented from sailing many degrees farther north from the apprehension of ice packing behind them and barring their return.

Other expeditions of less moment, in the regions to the north of Europe and Asia, have added a variety of information to that already possessed, and have furnished data for selecting the plans and routes of several great national expeditions that will doubtless start early in the coming summer —one of them German, and another Russian.

Much has been added to our previous knowledge of various portions of Asia and Africa, although in the latter country the principal interest has centred in regard to the actual condition of Dr. Livingstone. The partial efforts to determine his whereabouts, and to extend any needed assistance to him, are to be supplemented by a more extended movement now in progress in Great Britain. The movements of Sir Samuel Baker in his exploration of the Nile are watched with great interest, on account of the enormous scale of his labors, prosecuted under the direct patronage of the authorities of Egypt. Reports of progress from Dr. Schweinfurth and Dr. Nachtigal are presented in Petermann's Mittheilungen. The rush of visitors to the diamond fields of South Africa has also tended greatly to extend our knowledge of the geography and geology of that part of the world. The

recently published explorations in Madagascar, by Grandidier, have filled out a large gap in the history of that country.

In our own country an unusual amount of exploration has been prosecuted in the Far West, the expeditions of Mr. Clarence King, Dr. Hayden, Professor Marsh, Captain Powell, Lieutenant Wheeler, and others, contributing to swell the general result.

Although no special work of note has been done in Central America during the year, the reports of the expeditions to the Isthmus of Darien and the Isthmus of Tehuantepec have been published in brief, and are in course of preparation on a more elaborate scale. Professor Hartt has made a further exploration of Brazil, in continuation of several preceding it, and has brought back valuable collections of natural history, and many notes upon the languages and the ethnology of the country.

Quite a number of parties have been engaged in prosecuting inquiries in regard to temperature, currents, and organic life in the deep seas, the most important expedition being that of the *Hassler*, which left Boston in December last, with Professor Agassiz and a party of specialists on board, and which expects to prosecute its labors all the way to California by the way of the Straits of Magellan. Advices have been received from the party as far as Pernambuco, showing already a gratifying amount of success in their mission. Other local explorations of the same kind have been conducted by the *Flora* and other vessels on the coast of Great Britain; by the *Porcupine* in the Mediterranean; in the Gulf of St. Lawrence by Mr. Whiteaves; and in the Vineyard Sound by Professor Baird, Professor Verrill, and their associates; while similar labors were prosecuted by Professor S. J. Smith in Lake Superior, and by Mr. J. W. Milner in Lake Michigan.

The usual amount of activity has been exhibited in the way of research in *Zoology*, both general and special; and not only have numerous specimens been described, but many important facts in regard to the habits and peculiarities, physiological relationships, etc., have been announced. The pages of the present Record must be referred to for fuller information on this subject, as it is difficult to make a selection of what is really considered as most important. We may mention, however, that the subject of Darwinism has elicited a

great deal of discussion, and excited much commendation as well as animadversion. The tendency, however, appears more and more decided on the part of naturalists to adopt this doctrine, and there are now few naturalists of eminence who have not given in their adhesion to the proposition that all organisms are the more or less modified derivatives from antecedent forms. One of the most notable works in this field published in 1871 was "On the Genesis of Species," by Mr. Mivart. While Mr. Mivart opposes "Darwinism" proper, or Mr. Darwin's explanation of the *modus operandi* of evolution by natural selection, or rather contends that the operation of natural selection is much more limited than Mr. Darwin believed, he accepts fully the doctrine of evolution per se. While acknowledging, however, that man's body has been developed from a simian form, he believes that his intellectual and spiritual pre-eminence are due to direct creative intervention. The tendency of the German naturalists, on the other hand, is toward a more full acceptance of the views of Mr. Darwin, some undertaking to carry them to conclusions beyond what was contemplated by the author.

Among the points of special interest may also be mentioned the discovery, by Dr. Greef, of a gigantic fresh-water Rhizopod of very low organization, allied in some respects to *Bathybius*, and named *Pelobius* by its discoverer. An announcement by Mr. Crace Calvert that the temperature of boiling water does not kill many forms of microscopic organization, and that it sometimes requires a heat of over 400° to accomplish this, has a very important bearing upon the question of spontaneous generation and sanitary precaution.

Other communications worthy of mention are those of Dr. Günther on *Ceratodus*, the remarkable amphibian-like fish of New Zealand; of Dr. J. E. Gray on the skulls of the tortoises; of W. K. Parker on the development of the skull of the frog and the eel; of Prof. Cope on the fishes of the Ambyacu, etc.

In *Botany* and *Horticulture* we have to record the appearance of the valuable report by Mr. Sereno Watson on the plants of Western North America, collected and observed by him during the expedition of Mr. Clarence King. Nothing of the kind has appeared in the United States for many years of equal value. The ravages of the Grape-vine Louse (*Phylloxera vastatrix*) still excite much alarm in Europe, as in the

rapid spread of the infection it threatens at no distant period to annihilate the wine-producing interest of Europe. As might be expected, numerous projects have been proposed for remedying the evil, one of the latest being that of so arranging the vineyards as to allow of their being flooded with water to a depth of several inches, which, it is asserted, will entirely destroy that form of *Aphis* inhabiting the roots.

In *Agriculture* and *Rural Economy* generally announcements are numerous, and bear upon a great variety of topics, both general and special. Investigations upon the germination of seeds, the influence of soils upon the growth of plants, the function of nitrous acids in soils, the effect of the salts of potash on plants, the mode of regulating and hatching silk-worm eggs, the extraction of ammonia from the atmosphere by humus, are among the number. For many valuable communications in this department we refer to the Annual Report and the Monthly Notices of the Agricultural Department at Washington, which has also published a quarto volume upon certain diseases of cattle, that will doubtless prove of great benefit to the community.

In *Pisciculture* great activity has been manifested both in America and Europe. The celebrated establishment at Huningue, in Alsace, having been recommenced under German auspices, bids fair to improve upon its previous administration. A national society has been formed in Germany looking toward progress in the same direction. In our own country the fishery commissioners of the several states have labored earnestly in the discharge of their duty, and the measures adopted by them to stock certain streams with salmon, shad, herring, etc., have proved highly successful, so that we have every reason to expect in a few years a restoration of fish in many parts of the country to their original abundance. The most striking experiments of the season have been that of supplying the Delaware River with salmon, and the Sacramento of California with shad. The former unfortunately proved a failure for a time; the latter, however, it is believed, has been a success.

The most startling achievement in the department of *Mechanics* and *Engineering* for the year is the completion of the Mount Cenis Tunnel, commenced in August, 1857, and finished, as far as the piercing of the mountain was concern-

ed, on the 26th of December, 1870, although it was not actually used for the passage of trains until within the past year. It may be a matter of interest to mention that the total length of the tunnel is 13,365 yards, the highest summit of the Alps above it being 5307 feet.

Various forms of artificial stone have been brought to notice, some intended to resist air and water, while others are recommended for furnaces and other localities requiring fire-proof material. Among them may be mentioned the selenitic mortar of Colonel Scott, the Sorel cement, the Coignet concrete, the Dinas stone, etc.

The dangers of railway traveling have been alleviated by the introduction into practical use of various forms of brake, in which air and steam are used as the agents to stop trains at high speed in a very short time. Improved indicators of velocity have also been devised.

The idea of constructing railways of narrow gauges for mountainous regions and those having a comparatively limited traffic has been a popular one, and numerous lines have been commenced both in this country and in the Old World. The average width selected seems to be about three feet six inches.

The views of experts in regard to the supposed deteriorating effect of cold upon iron seem to have undergone a change from the results of the experiments of Mr. Brockbank and Mr. Joule, of Manchester. From these it would seem that iron is actually made stronger instead of weaker by cold, while the unmistakable fact of the greater tendency of iron rails, wheels, and axles to break during cold weather is explained under the theory that the frozen soil is rendered more rigid and unyielding, and that the shock of impact is consequently much greater than where the soil possesses the elasticity attendant upon warmer weather.

The war between France and Germany, happily terminated during the past year, furnished an opportunity for testing various forms of military weapons, every variety having been brought into use and experimented upon during the campaign. The mitrailleuse and the Gatling gun, while not possessing the power of attack and defense attributed to them by their advocates, have yet proved serviceable in certain conditions, and are likely to be adopted in future war-

fare. The needle-gun of Germany was found very much inferior to the Chassepot of France, and both are likely to be superseded by the breech-loaders of American construction. The drift of opinion among experts as to the comparative merits of breech and muzzle loading cannon seems rather to have been settled in favor of the latter, such improvements in the construction of gun-carriages as that of Captain Moncrieff and others doing away to a considerable extent with the supposed superiority of the former.

It would require a volume to mention all the discoveries and valuable applications in the department of *Technology*. For this we must refer to such contemporaries as the Scientific American, to the Journal of the Franklin Institute, and other standard chronicles in this branch of science. Among a few, however, that occur to us, we may especially name the method of engraving on stone, glass, and even wood, by means of the continued action of an air-blast of sand, the results as to effect, and the economy of time and expense, being quite marvelous.

The applications of sundry new dyes to practical purposes have been very numerous, and greatly to the advantage of the dyer's art. Among these may be included artificial alizarine, which is now believed to be really superior to the native madder. The methods of extracting aniline dyes from all kinds of fabrics, as announced by Mr. Reimann, promise to be of great practical moment.

Photographic processes have been improved, especially in connection with the methods of reproducing photographic pictures by such processes as those of Messrs. Albert, Edwards, Woodbury, and others. Establishments have been opened in the United States for working under their patents, and bid fair to meet with a measure of success.

An announcement of much practical value is made in regard to the manufacture of glue, namely, that, for the purpose of drying it, the surplus moisture can be best removed by means of contact with salts instead of depending upon evaporation. The result is a diminution of the time of the operation by many days, which, in the warm weather of summer, may involve the saving of the entire product from injury by decomposition.

Improved methods for coating metals with nickel, cobalt,

zinc, etc., have been announced and brought into considerable use. For further details in this department we must refer to the pages of the *Record.*

The department of *Hygiene* has been enriched by important papers upon the microscopic fungi and their relationship to disease. Dr. Calvert shows us that the clothing and other objects infected with the germs, and, as such, liable to propagate infection of one character or another, must be exposed to a temperature of at least 400° before their vitality is certainly destroyed; this heat, indeed, being in many cases sufficient to char cotton cloth.

The subject of carbolic acid has also been discussed as to its efficiency, and it seems to have lost somewhat of the favor with which it was originally greeted. A long-known substance, called chloralum, recently brought forward as an antiseptic by Dr. Gamgee, has also received a varying degree of commendation and approval.

In the department of *Materia Medica* much interest has centred, as far as the United States is concerned, in the question of the virtues of cundurango, the supposed remedy for the cure of cancer. Much speculation has been indulged in in regard to the actual value of this substance, many persons believing it to be a success, and others considering it entirely inefficient. The decision of this question, however, we must leave to pharmaceutical specialists.

Among the *Miscellaneous* subjects, or those that can hardly be assigned to one branch rather than another, we may mention that of psychic force, brought forward by Mr. William Crookes as the result of certain experiments made with the aid of the celebrated medium, Mr. David D. Home. Mr. Crookes is a chemist of much eminence in the science, and the announcement made by him, as the result of numerous experiments, that he can not resist the belief in the existence of a new and hitherto unrecognized force, has been received with much surprise. The principal manifestations of this law, according to Mr. Crookes, are, that the gravity of certain bodies can be measurably or even greatly increased, under certain circumstances, at the will of a particular individual, the extent varying with the nerve-power of the person and the particular circumstances of the experiment. Very few of Mr. Crookes's colleagues concur with him, and the great body

of physicists are entirely incredulous. The final decision must be left to the result of continued and careful experiments by physicists of established reputation.

The scientific societies of Holland have associated themselves to form what they call a Central Bureau of Exchange, for the purpose of carrying out the system of international distribution of publications inaugurated by the Smithsonian Institution, and with which they propose to act as far as relates to the United States. All the publications of scientific institutions and learned men in Holland, to be transmitted to correspondents in other parts of the world, are to be sent to the central establishment in Holland, at Haarlem, under the direction of the Academy of Sciences of that city, by which they are to be made up into parcels and forwarded to corresponding institutions in other parts of the world.

The destruction by fire of the building, collections, and library of the Academy of Sciences of Chicago has been a great blow to that thriving establishment, especially as the material within its walls was of extraordinary value, and embraced rich treasures in science. A vigorous effort, however, is to be made to recover the losses, and it is not unlikely that a few years will see this institution again on its old footing.

The destruction of the greater part of the whaling fleet in the North Pacific by ice during the past autumn has been a calamity to the whaling interest of no ordinary magnitude, second only, indeed, to the damage caused by the privateers during the late rebellion. Most of the vessels, as might have been expected, were from New Bedford, and their loss represents the abstraction of a large portion of the capital of that city.

In a summary of the present character, it is, of course, impossible for us to weigh with any degree of precision the comparative value of the various discoveries made, or to decide upon their practical bearing, since some of the most valuable will not develop the full measure of their utility until long after their first announcement. To those wishing to become acquainted with any particular department of knowledge, we must refer, as far as the present work is concerned, to the systematic Table of Contents and to the Alphabetical Index, where we trust they will not be entirely disappointed.

ANNUAL RECORD

OF

SCIENCE AND INDUSTRY.

1871.

A. MATHEMATICS AND ASTRONOMY.

NATURE OF THE SUN'S CORONA.

Mr. Proctor, in a recent article upon the solar eclipse of December 22, 1870, remarks that especial effort will probably be directed toward the solution of the problems connected with the character of the sun's corona; and he sums up in a few words the different hypotheses that have been heretofore presented on the subject. These assign to the corona very different positions in space. The first places the corona around the sun, the second around the moon, and the third in our own atmosphere. Whichever of these may be considered as established, we shall have three different degrees of magnitude and importance to assign to the corona. If it be a solar appendage, its extent exceeds that of any body within the solar system, save, perhaps, one or two of the most remarkable comets; if belonging to the moon, it is relatively insignificant, but still has a volume far exceeding that of the earth; lastly, if confined within the bounds of our atmosphere, it no longer is to be considered as possessing any real existence any more than the beam of light which shines through the clouds can be regarded as an actually existent, measurable mass. These hypotheses he discusses in their order, and finds reason to consider them all untenable; and finally presents a different view from any, namely, that the

corona consists of some sort of matter, whether separate solid or liquid bodies, vaporous masses, or groups in which solid or liquid bodies are intermixed with vaporous masses, traveling round the sun. From this conclusion he sees no escape, should the others be rejected; to his mind there being no remaining proposition that can be presented on the subjeet. He therefore waits with much interest the result of the experiments which will be prosecuted with the direct object of testing the question—with a calm assurance, however, that his suggestion will be the one ultimately substantiated.—5 *A*, *October*, 1870, 378.

PROCTOR ON THE SOLAR CORONA.

Mr. Richard A. Proctor has published in the April number of the *Quarterly Journal of Science* a critical discussion of the observations made during the eclipse of last December, with special reference to the interpretation of the solar corona. It may be remembered that just before the eclipse took place he showed within what limits the problems to be solved by the phenomena in question were restricted, and stated that the principal object to be reached was the determination of the questions connected with the corona. He now proceeds to show to what extent the ground has been covered, how far his own anticipations have been fulfilled, and what yet remains for further inquiry. In this paper he introduces what he considers a reform in the nomenclature of the sun, substituting the word "sierra" for the colored layer or envelope of prominence-matter in the sun to which the name chromosphere has usually been given. The paper is followed by a summary of the fruits of the various eclipse expeditions; namely, in the first place, that the corona has at length been photographed, so that its peculiarities may be studied at our leisure, without fear of mistakes arising from inexact delineation; second, that the connection between the ring-formed and the radiated corona has been demonstrated by the photographic and other evidence, showing how the height of the bright inner corona corresponds with that of the outer corona (this is thought by him to be a most important discovery); third, that the fact of one of the lines of the corona spectrum being identical with Kirchhoff's 1474, a line seen in the spectrum of our own aurora, has been abundantly demonstrated;

fourth, that the region in which the Fraunhofer lines have their origin has been ascertained and shown to be an atmospheric envelope (which may be some two or three hundred miles deep) lying immediately above the atmosphere; fifth, that the theory that the sierra is of the nature of an atmosphere has been invalidated, and that the earlier opinion (which Professor Respighi had supported on the evidence of his spectroscopic observations) has been confirmed, if not demonstrated, namely, that the sierra consists of multitudes of rosy prominences, resembling the large ones in all other attributes except size.—16 *A*, *April*, 1871, 247.

THE SOLAR ECLIPSE OF DECEMBER, 1870.

The following report of the late solar eclipse, and of the results accomplished by it, is furnished by one of the most eminent of our American astronomers, and one who occupied a prominent part in the observations made:

The weather along the narrow line of the late total eclipse was generally unfavorable. Out of twenty or more parties of observers, whose positions extended from the Atlantic to the Adriatic, about half saw nothing whatever of the total phase, and most of the other half were seriously interfered with by the clouds. The Americans were generally more fortunate than their European brethren. At Xeres, near the Atlantic coast of Spain, Professor Winlock's party was entirely successful. So was the English party at Cadiz under Lord Lindsay. At Oran, in Algeria, the station selected by Professors Tyndall and Huggins, a dense black cloud covered the sun a few minutes before the critical moment, and did not disappear till all was over. At Syracuse, the party from the Naval Observatory, Messrs. Hall, Harkness, and Eastman, were successful; while at Catania and on Mount Etna none of the parties saw any thing.

The first object of nearly all the parties was to learn something of the constitution of the corona, and especially to confirm or disprove the observations of the American observers on the eclipse of August 7, 1869, which seemed to show that the corona consisted of a glowing gas. The instrumental means employed for this purpose were the spectroscope, the polariscope, and photography.

One of the best organized spectroscopic parties was that at

Xeres, under charge of Professors Winlock and C. A. Young. They had four or more spectroscopes, of which two were used by English volunteers. Their observations confirmed the existence of bright lines in the spectrum of the corona, which had been observed by Harkness and others in 1869, but which the English astronomers were slow to believe in. The most remarkable of these lines is a green one, supposed to be identical with one of the lines of iron, and with the line found by Angstrom in the aurora and in the zodiacal light. This line was traced by Professor Winlock to a distance of near 20′ from the sun's limb. Professor Young traced it 16′ on the west, 12′ on the north, 14′ on the east, and 10′ on the south.

The other two spectroscopes were arranged so as to collect the light from the entire corona and protuberances at once. With one of these Mr. Abbay saw only two lines—the one just referred to, and the other the F line. With the other Mr. Pye saw also the lines C and D3. All except Mr. Abbay saw a faint continuous spectrum without dark lines.

But the most interesting observation was the following by Professor Young: "Just previous to totality, I had carefully adjusted the slit tangential to the sun's limb at the point where the second contact would take place, and was watching the gradual brightening of 1474 and the magnesium lines. As the crescent grew narrower I noticed a fading out, so to speak, of all the dark lines in the field of view, but was not at all prepared for the beautiful phenomenon which presented itself when the moon finally covered the whole photosphere. Then the whole field was at once filled with brilliant lines, which suddenly flashed into brightness and then gradually faded away, until in less than two seconds nothing remained but the lines I had been watching." There can be little doubt that these bright lines emanate from the same atmosphere, the absorption of which causes the dark lines of the spectrum, the same rays which, by contrast, look dark alongside of sunlight, being bright when the sunlight is cut off by the moon. The existence of this atmosphere was long ago inferred from the dark lines of the solar spectrum, and Secchi had inferred that it formed a very thin layer over the surface of the photosphere, from noticing that the dark lines faded out at the extreme edge of the sun; but Young was,

so far as we know, the first and only one to recognize it during an eclipse by its own bright lines.

The well-organized parties under the eminent English spectroscopists Messrs. Roscoe and Lockyer were prevented by clouds from seeing any thing; and, so far as we can learn, none of the other observers did more than confirm some of the phenomena observed by Winlock and his party.

All the observers describe the continuous spectrum of the corona as being devoid of all dark lines. This has been regarded as showing that the corona shone almost entirely by its own light, because the dark lines are seen in the spectra of all bodies which shine by reflected sunlight. But the polariscope observations seem to show that there is much reflected sunlight in the corona. In Professor Winlock's party, Professor Langley observed with a Savart's polariscope attached to a small telescope. The bands were distinctly seen on the corona, and were brightest where normal or tangential to the limb. It is understood that Professor Pickering, who used an Arago's polariscope, also saw evidences of polarization. But Professor W. G. Adams, of London, who observed in Sicily, saw no evidence of polarized light, while his assistants saw it very plainly. On the whole, the evidence seems strongly in favor of polarization, and therefore of some reflected light.

Striking a general average among all the observations and the conclusions to be deduced from them, it may be fairly concluded that the sun is surrounded by four or more envelopes.

1. A gaseous layer about five hundred miles thick, containing a great number of chemical elements, which produce the ordinary dark lines of the spectrum by elective absorption. 2. The red chromosphere and prominences, composed mainly of glowing hydrogen, and extremely irregular in outline. 3. A sphere of some very rare gas, hitherto unknown, shining mainly by its own light, and forming the base of the corona: the new green line proceeds from this gas. 4. Irregular masses of light, extending a degree or more from the limb of the sun, the origin and nature of which are involved in obscurity. These are found in the photographs, so they can not be purely optical illusions; but it is still an open question whether they originate in our atmosphere, in the planetary spaces, or in the neighborhood of the sun.

RESPIGHI ON SOLAR PROTUBERANCES.

The April number of the *American Journal of Science* contains an interesting account of observations upon the solar protuberances, by Professor Respighi, translated for its columns from the Italian by Professor Wright. The conclusions arrived at are, in the main, similar to those of Professor Zöllner, of which an account is given elsewhere; the essential idea seeming to be that the photosphere is an incandescent liquid mass or stratum, by the weight of which various gases, especially hydrogen, are confined and compressed in the interior of the sun at an elevated temperature, and that these occasionally rise toward the surface with great velocity, until they force themselves through with a rapidity greater or less according to the depth from which they emerge. The Professor suggests that it is these agitations and eruptions which constitute the protuberances, and that the hydrogen issuing from the body of the sun serves as an aliment to the chromosphere, thus repairing the repeated losses of the latter by its not improbable combination with the substance of the photosphere; and it is suggested, also, that possibly this immense stratum of incandescent hydrogen—to wit, the chromosphere—may be the principal source of heat radiated from the sun.

The solar spots, according to Professor Respighi, are neither cavities nor clouds, but are superficial modifications or partial obscurations of the photosphere, produced by scoriæ or scum floating upon it; or, as it were, solid masses of islands floating upon the liquid stratum.—4 *D*, *April*, 1871, 283.

TEMPERATURE OF THE SUN.

Dr. Zöllner, whose graphic pictures of the phenomena of the solar atmosphere are well known to many of our readers, has lately discussed anew the question of the temperature and physical condition of the sun. Assuming that the prominences which present the appearance of eruptions are really produced by the action of explosive forces projecting vast quantities of glowing hydrogen into the chromosphere, he applies the principles of thermo-dynamics to determine the heat and pressure in different portions of the sun's mass and atmosphere. He obtains as a probable minimum value for

the temperature of the chromosphere, 49,850° Fahr.; and for the temperature of the interior region, whence the hydrogen is erupted, 123,150° Fahr. Assuming the atmospheric pressure at the base of the chromosphere to be about equal to seven inches of the mercurial barometer, he finds the pressure at the level of the nuclei of the spots to be about 184,000 atmospheres, and the pressure in the inner region before named no less than 4,070,000 atmospheres.—5 *A*, *October*, 1870, 419.

CHARACTER OF SUN-SPOTS.

According to a recent communication of Professor Zöllner, as given in *Nature*, "the sun-spots are slag-like by the radiation of heat on the glowing and liquid surface of the sun, the products of the cooling having again dissolved in consequence of the disturbance of equilibrium produced by themselves in the atmosphere. When these disturbances are not only local, but generally distributed, the formation of new spots is but little favored at the times of such general motion of the atmosphere, because then the most essential conditions of the surface are wanting for a severe depression of temperature by radiation—namely, the rest and clearness of the atmosphere. But when the surface has again gradually become quiet after the dissolution of the spots, the process again recommences, and acquires in this manner a *periodic* character, in consequence of the mean relationships of the surface of the sun, which may be considered as attaining an average in long periods. The distribution of the spots in area must, according to this theory, be determined by the zones of the greatest atmospheric clearness, whieh, as has been shown, generally coincide with the zones of the greatest abundance of spots." —12 *A*, *March* 16, 1871, 393.

COINCIDENCE OF THERMOMETRIC AND SUN-SPOT CURVES.

Mr. Stone, the astronomer royal at the Cape of Good Hope, in comparing the thermometric curves taken at the Cape since 1841 with those in Wolf's observations on the sun-spots, finds an agreement between the two series so close as to induce him to think that the same cause which leads to the excess of mean annual temperature leads equally to a dissipation of solar spots, and also that there is an approximately decennial period of such temperature. He leans, how-

ever, to the opinion that the connection between the variation of mean temperature and the appearance of the solar spots is indirect rather than direct, and that each results from some general change in the solar energy.—12 *A, March* 30, 434.

PROOF OF THE NEBULAR HYPOTHESIS BY THE SPECTROSCOPE.

In the September number of the *American Journal of Science*, Professor Daniel Kirkwood presents the testimony of the spectroscope in regard to the truth of the nebular hypothesis, beginning by calling attention to the supposed annihilation of this hypothesis by the observations of Lord Rosse and of Professor Bond, both of whom succeeded, in March, 1846, as they thought, in resolving certain supposed nebulæ in the stars. These observations were considered by the majority of astronomers as fatal to the claims of the nebular hypothesis. But, according to Professor Kirkwood, this has more than recovered from the shock it received, and the more recent application of the spectroscope to the investigation of the nebulæ proves its truth conclusively. The general result of the later examinations he sums up in the following manner:

1. The ring nebula in *Lyra*, the dumb-bell nebula, the great nebula in *Orion*, and others which might be named, are not, as was but recently believed, extremely remote sidereal clusters, *but their light undoubtedly emanates from matter in a gaseous form.*

2. According to Lord Rosse and Professor Bond, the brighter parts near the trapezium (in the nebula of Orion) consist of clustering stars. If this be the true appearance of the nebula under great telescopic power, then these discrete points of light must indicate separate and probably denser portions of the gas, and the whole nebula is to be regarded rather as a system of gaseous bodies than as an unbroken vaporous mass.

3. Progressive changes in the physical condition of certain nebulæ are clearly indicated by the fact that nuclei have been established which, as shown by their spectra, are not wholly gaseous, but have passed, at least partially, to the solid or liquid form.

4. The spectroscopical analysis of the light of several comets reveals a constitution similar to that of the gaseous nebulæ.

The spectroscope, then, has *demonstrated* the present existence of immense nebulous masses, such as that from which Laplace supposed the solar system to have been derived. It has shown, moreover, a progressive change in their physical structure, in accordance with the views of the same astronomer. In short, the evidence afforded by spectrum analysis in favor of the nebular hypothesis is cumulative, and of itself sufficient to give this celebrated theory a high degree of probability.—4 *D*, *September*, 1871, 155.

DETERMINATION OF THE MASS OF THE MOON BY TIDAL OBSERVATIONS.

At the meeting of the National Academy of Sciences on the 19th of April, 1871, Mr. William Ferrel, of the United States Coast Survey, gave an account of his discussion of tidal observations with reference to determining the mass of the moon. He used in this investigation a series of observations made for the Coast Survey during nineteen years—a full lunar cycle—at Boston, Massachusetts, and a similar series of observations made at Brest, France, from 1812 to 1831 inclusive.

Without going into the mathematical form of the investigation, he endeavored to show that the moon's mass must be mainly inferred from the ratio which the spring and neap tides bear to the constant or average tides. This ratio, however, does not depend entirely upon the moon's mass, but varies greatly for different ports, the heights and times of the tide being modified by local circumstances; and, consequently, the tides have not been hitherto considered an available means for determining the mass of the moon.

In addition to the constant, to be determined by observation, introduced into the conditions by Laplace for determining the moon's mass, Mr. Ferrel has introduced another, depending upon friction. Hence, there being three unknown quantities to be determined, including the moon's mass, he uses the condition depending upon the moon's parallax in addition to the two used by Laplace. Without the introduction of this additional constant and the additional condition for eliminating it, Laplace's conditions for the determination of the moon's mass entirely fail when applied to the Boston tides.

Laplace selected Brest, where the tide has a direct and short approach from deep water, and, neglecting the effect of friction referred to, obtained, as is well known, the value of $\frac{1}{74.96}$, in terms of the earth's mass, for the mass of the moon. At Brest the ratio of the half-monthly inequality to the co-efficient or half range of the constant tide is about .358, that of the constant tide being about 2.25 metres, and that of the mean spring-tides about 3.05 metres. At Boston the same ratio is only about .14, the co-efficient of the constant tide being 4.91 feet, and that of the mean spring-tides 5.58. From data so widely different Mr. Ferrel has deduced, by means of the introduction of the term depending upon friction, two values exhibiting a remarkable agreement, viz., from the Brest tides $\frac{1}{77.14}$, and from those at Boston $\frac{1}{78.64}$. — *Pr. Nat. Acad.* (unpublished).

PARALLAX OF A STAR.

The bright star α Lyræ must now be added to the few of which the parallax is known with considerable accuracy. Dr. Brünnow, formerly director of the observatory at Ann Arbor, and now astronomer royal for Ireland, has lately computed a series of careful and most accurate measurements on this star, made by comparison with a minute star near it, known as Struve's Companion. The result is that the parallax is almost exactly one fifth of a second. An idea of the smallness of this angle may be formed by reflecting that the smallest visible object subtends an angle of about one minute; so that if the angle which Dr. Brünnow had to measure were increased three hundred times, it would still appear to the naked eye as a mere point. Yet this is the angle subtended by the distance from the earth to the sun as seen from the star. The corresponding distance of the star is a little more than a million times that of the sun, or about 93,000,000,000,000 miles. Previous determinations of this parallax, by Peters and the Struves, have ranged from one tenth to one fourth of a second; but the extreme difficulty of measuring so small an angle made them all a little doubtful.—(Communicated.)

IS THE AURORA VISIBLE IN DAYLIGHT?

The question whether the aurora is visible by daylight, as propounded some time ago in *Nature*, has met with several

responses, some denying and others asserting the possibility of such a phenomenon. A Quebec correspondent, however, insists most positively that he has distinguished, in broad daylight, a movement of what appeared to be a light fleecy cloud, which had the changeability and streaming character of an aurora, and which, as night came on, developed into an aurora of the first magnitude.—12 *A, March* 2, 348.

ANCIENT PHŒNICIAN SUN-DIAL.

Some considerable interest has lately been excited by the exhibition, before the Academy of Sciences of Paris, of a fragment of an ancient sun-dial, obtained during the French campaign in Syria in 1860 by M. Renan. This gentleman, then forming part of the scientific mission connected with the army, caused excavations to be made in different localities in ancient Phœnicia, and among the objects of more or less interest brought to light in this way was the fragment in question. It presented certain mathematical peculiarities which are too technical to be introduced here, but its entire arrangement was quite scientific, and it has been restored and completed so as to show very distinctly the plan. The epoch of its construction is believed to be subsequent to that of the great Geometers of Alexandria, without whose labors and discoveries it could not have been worked off; and it is probable that it is to be included among the works of the Greco-Egyptian renaissance.—6 *B, July* 25, 261.

METEORIC SHOWER IN SWEDEN.

A late number of Poggendorff's *Annalen* makes mention of a shower of meteoric stones which took place in Sweden on the 1st of January, 1869, not far from Upsala. These were scattered over a large extent of country, and one of them fell on the ice close to some fishermen, and penetrated to a depth of three or four inches. The largest of the stones weighed about two pounds, and the smallest were very minute. While most of them contained, in large part, the usual ingredients of such objects, there were others composed mainly of carbon, the percentage of this element amounting to over one half, the other principal ingredients being oxygen, hydrogen, silica, and peroxide of iron.—13 *A, December* 15, 1870, 71.

TACCHINI ON THE PROTUBERANCES OF THE SUN.

Professor Tacchini, of the Observatory of Palermo, has lately published some observations upon the protuberances of the sun, and sums up his conclusions as follows:

1. That the protuberances are divisible into two great categories—*filamentous*, and *simply* vaporous.

2. That in the great refractor of Merz the protuberances are observed with the greatest precision and clearness.

3. That with powerful instruments the separation of the protuberances into the two categories is quite evident, while with small instruments the observer may fall into the error of attributing a common structure, without distinction, to the protuberances in general, which explains the differences in the various observations made with ordinary instruments.

4. That the whole of the border of the sun is a series of flames.—3 *A*; *September* 23, 230.

EXPLOSION IN THE SUN.

The Boston Journal of Chemistry contains a communication from Professor Young, of Dartmouth, in reference to an outburst of solar energy remarkable for its suddenness and violence. Professor Young's attention had been directed for some time toward an enormous protuberance of hydrogen cloud on the eastern limb of the sun, which had remained with little change since the preceding noon, in no way remarkable except for its size. It was made up mostly of filaments, nearly horizontal, and floated above the chromosphere, with its lower surface at a height of some fifteen thousand miles, but was connected to it by three or four columns brighter and more active than the rest. The total length was about one hundred thousand miles, and depth about forty thousand.

After an absence of a few minutes, a remarkable change was observed by Professor Young to have taken place in this object, caused by its violent disruption during that period. In place of the quiet cloud, the space above it was filled with floating débris, a mass of detached, vertical, fusiform filaments in rapid motion, some of them having already reached a height of nearly one hundred thousand miles, and still rising with a motion almost perceptible to the eye, until in ten min-

utes the uppermost were more than two hundred thousand miles above the solar surface. The velocity of ascent, one hundred and sixty-six miles per second, was considerably greater than any hitherto recorded.

As the filaments rose they gradually faded away like a dissolving cloud, and in about twenty minutes only a few filmy wisps, with some bright streamers, low down near the chromosphere, remained to mark the place. The whole phenomenon suggested most forcibly to Professor Young the idea of an explosion under the great prominence, acting mainly upward, but also in all directions outward, and then, after an interval, followed by a corresponding inrush; and it is thought possible that the mysterious coronal streamers, if they turn out to be truly solar, may find their origin and explanation in such events. In conclusion, Professor Young inquires whether the fine aurora which succeeded in the evening was the earth's response to this magnificent outburst of the sun, and thinks the coincidence at least suggestive.—12 *A*, *October* 19, 488; *Boston Journal of Chemistry.*

REDISCOVERY OF THE PLANET ERATO.

Professor Oppolzer, of Vienna, has, after a careful calculation and examination, rediscovered the planet Erato, which has been lost for over eight years, and has fixed its present position so that it can be readily found by the more powerful telescopes. There still remain, however, quite a number of planets, such as Maja, which has not been seen for fifteen years, and ten others which were seen only once, and the rediscovery of which is hindered by the want of proper opportunities of observers and of suitable telescopes.—1 *C*, XL., 640.

PERIOD OF THE SUN'S ROTATION SHOWN BY MAGNETIC OBSERVATIONS.

Hornstein has lately presented a paper to the Vienna Academy, in which he endeavors to show that the variation of each one of the three elements of terrestrial magnetism (namely, *declination*, *inclination*, and *horizontal intensity*) occur in a period of twenty-six and one third days.

This periodic variation, as he thinks, is caused by the rotation of the sun; and as the duration of the period, from the mean of observations, consists of 26.33 days, we have what

may be considered the result of the first effort to determine the synodic period of rotation of the sun, by the help of the magnetic needle. The true period of the rotation of the sun would hence appear to be about 24.55 days, very closely coinciding with the value obtained from astronomical observations from the period of rotation of the spots on the equatorial zone of the sun (according to Spörer, 24.041 days).—19 *C*, xxxv., *September* 2, 284.

TRANSIT OF VENUS IN 1874.

The attention of astronomers throughout the world is directed toward the approaching transit of Venus, to occur on the 18th of December, 1874, and it is hoped that the United States Congress, with the same liberality that induced it to make an appropriation for the observation of the solar eclipse of December last, and for the polar explorations under Captain Hall, will also, at the proper time, advance the funds necessary for the research in this case. The British, German, and other foreign governments have already initiated measures looking toward concerted action on the part of European astronomers in reference to the observation of this phenomenon; and Professor Hall, of the Washington Observatory, in a late communication to the Journal of Science, expresses the hope that a similar concert of action will be settled upon by American astronomers, in order that they may not be behind their European confrères in the attempt to secure satisfactory results. A committee has been appointed by the National Academy of Sciences to take into consideration a general plan of operations, and it is expected that a report will be made on the subject at the approaching meeting in Washington City.—4 *D*, *April*, 307.

PRIZE FOR TELESCOPIC COMETS.

The Imperial Academy of Sciences of Vienna has offered a prize of twenty Austrian ducats, or a gold medal of the same value, for the discovery of not less than eight new telescopic comets prior to the 1st of June, 1872. This is in view of the fact that, whatever the progress made in astronomy generally, but little has been added to our knowledge of the comets, and at the present day we can only catalogue two or three hundred out of the many thousands that doubtless belong to

our system. As observatories have their regular work, which will not permit them to search for these bodies, it is expected that professors and private parties in possession of good telescopic instruments will enter the field in competition for the prize.—15 *A*, *July* 29, 148.

NEW ASTEROID.

A new planet was discovered on the night of September 13 last, at Marseilles, by M. Borelli, and named by him Lomia. This constitutes the one hundred and seventeenth in the series of asteroids found between Mars and Jupiter.

NEW ASTEROID.

Another was discovered on the 11th of September by Dr. Peters, of Hamilton College, New York, the same body having been observed six days afterward by Luther, at Bilk. This will be the one hundred and sixteenth of the series.

THE NATURE OF COMETS.

M. Faye, of the French Academy of Sciences, has lately read to that society two elaborate papers on the history and present state of the theory of comets. He commences with some critical remarks on a passage in the address of Sir William Thompson before the British Association last summer, in which the latter spoke of the comet's tail as having been one of the insoluble mysteries of astronomy. M. Faye concludes from this view that the Continental astronomers have not spread the knowledge of their labors in England, and that the English have forgotten Newton's "Principia." According to Faye, it is an established principle that the tails of comets, whether simple or compound, are due to a repulsive force exerted by the sun. The principal characteristics of this force have been clearly determined. Far from contradicting the received laws of mechanics, as Herschel seemed to suppose, it is precisely by means of these laws that the most complicated phenomena of the tails have been accounted for on the hypothesis of a repulsive force. All that is wanting is to learn the exact nature of this force, and, if possible, exhibit its action experimentally. This is what the author has attempted. He lays down a law, or, rather, until it is proved experimentally, a hypothesis, which he calls the

law of repulsion of incandescent surfaces. He considers that white-hot bodies in general exert a repulsive force on matter in a very rarefied state, but that this force differs from that of gravitation in residing in and acting upon the surfaces of bodies only, and in being intercepted by a screen of solid matter.

Considering the existence of this apparent repulsive force as indisputable, M. Faye passes in review the theories of its origin. First, we have the theory of Newton, now forgotten in England, that the sun is surrounded by an extremely rare atmosphere extending beyond the orbit of the earth, and that the rare matter of the comet's tail rises in this atmosphere, just as smoke does in our own atmosphere. The objection to this theory is that the sun is not and can not be surrounded by any such atmosphere.

Then we have the hypothesis of Olbers, now adopted by Zöllner, that the repulsion is due to the electricity of the sun. This last investigator shows that if the electric tension of the outer layers of the sun's atmosphere is as great as is frequently seen at the surface of the earth, a little sphere of matter, half an inch in diameter, and weighing one sixtieth of a grain, repelled by the supposed electricity of the sun's atmosphere, would, when it reached the orbit of Mercury, be flying with a velocity of 2000 miles per second. This view is objected to because it is shown that there can be no electric action in a vacuum.

Another theory lately put forward is that of Professor Tait, who, however, dispenses with the repulsive force, and considers that the whole comet is only a vast swarm of flying meteorites moving in a flat layer, which is only visible when we look at it edgewise. He compares it to a flock of birds, which are invisible when spread out, but plainly seen when they are in a line with the eye of the observer. M. Faye considers that this theory sets at naught all existing science, whether observations or theory. But he looks with more favor on another part of Tait's theory—that the light of the comet arises from collisions among the meteorites which compose it, and which are thus continually striking fire, as we may familiarly express it.

M. Faye has attempted to prove his hypothesis by trying whether a white-hot metallic plate would repel rarefied air. The experiment was made in the presence of several savants,

and a repulsion was actually exhibited. Unfortunately, however, there was some difference of opinion about the interpretation of the phenomena, and the decisive test has yet to be applied.

SPECTRUM OF ENCKE'S COMET.

Professor Harkness, in a communication on Encke's comet, states that ever since November 18 it became steadily brighter and brighter, and its spectrum more distinct. On the evening of December 1 the spectrum consisted of three bright bands; the most refrangible one being very faint, the middle one by far the brightest, and the least refrangible one having a degree of brilliancy intermediate between that of the other two. The shape of each of these bands somewhat resembled an isosceles triangle, with its base turned toward the red end of the spectrum. In the case of the two brighter bands the light increased quite rapidly from the less refrangible edge of the band, until it attained its maximum at a point distant from that edge by about one quarter of the whole breadth of the band, and thence it gradually faded away toward the more refrangible edge of the band. In the case of the most refrangible band, the light seemed to be of nearly equal intensity throughout its whole breadth. The positions of the two brighter bands were measured, and the resulting wave-lengths of the light, expressed in millionths of a millimetre, are approximately as follows: First band, less refrangible edge, 556; brightest part, 550.0; more refrangible edge, 534: second band, less refrangible edge, 515; brightest part, 510.9; more refrangible edge, 499. The position of the faint band was estimated, and the resulting wave-lengths are, for the less refrangible edge, 458, and for the more refrangible edge, 448. At times he fancied he also saw a faint continuous spectrum, but could not satisfy himself that it really existed.

Both in appearance and wave-lengths this spectrum bears such a remarkable resemblance to that of the second comet of 1868, that Professor Harkness is strongly inclined to think their physical constitution must be identical. It will be remembered that the observations of Dr. Huggins showed that the spectrum of the latter comet was the same as that of olefiant gas.

Perhaps the strangest feature observed in connection with the spectrum of Encke's comet was the progressive shifting of the point of maximum brightness in its middle band. The observed wave-lengths of the light of this point, on different nights, are aproximately as follows: November 18, 501.0; November 25, 505.7; November 26, 505.9; November 27, 510.0; November 29, 510.0; December 1, 510.9; December 2, 511.9. It should be stated that while these changes were going on the band increased in breadth.

The comet was examined carefully with a double-image prism, but without finding any traces of polarization in its light.

VELOCITY OF METEORIC STONES.

Professor John le Conte, of the University of California, communicates to *Nature* an article upon the maximum velocity of meteoric stones on reaching the surface of the earth, in which he adverts to the statement of Nordenskjöld, that meteoric stones, weighing two pounds each, fell on the ice of a certain lake in Sweden, and failed to penetrate, making holes only three or four inches deep in the ice, and rebounding. This slight velocity, however, he shows, by a careful calculation, to be entirely normal, and the result of the resistance of the air, and not to be in any measure an indication of the velocity which they had when entering the atmosphere. In the cases of small stones, the professor states that the resistance of the medium would very speedily produce retarded motion, and before traversing twenty or thirty miles of air they would probably move with a velocity approximating uniformity, and under the action of gravity alone. In other words, they would gradually lose their original velocity of translation, and, descending nearly or quite vertically, under the action of gravity, would ultimately attain a maximum velocity, under the opposing influences of the resisting and accelerating forces, and then descend to the earth with a uniform velocity.

He thinks, however, the case would be different in proportion as the mass is greater.—12 *A*, *September* 14, 1871, 398.

B. TERRESTRIAL PHYSICS AND METEOROLOGY.

THERMO-DYNAMIC ACCELERATION AND RETARDATION OF STREAMS.

In a paper by Professor Rankine, on the thermo-dynamic acceleration and retardation of streams, the attempt was made to prove the following principle: That in a steady stream of any fluid the abstraction of heat at and near places of minimum pressure, and the addition of heat at and near places of maximum pressure, tend to produce acceleration; the addition of heat at and near places of minimum pressure, and the abstraction of heat at and near places of maximum pressure, tend to produce retardation; in a circulating stream, the quantity of energy of flow gained or lost in each complete circuit is equal to the quantity of energy lost or gained in the form of heat; and in the absence of friction, the ratios borne by that quantity to the heat added and the heat abstracted (of which it is the difference) are regulated by the absolute temperatures at which heat is added and abstracted, agreeably to the second law of thermo-dynamics.

Among particular cases of the thermo-dynamic acceleration and retardation of streams the following were specified: Acceleration by the addition of heat at and near a place of maximum pressure; the draft of a furnace; and the production of disturbances in the atmosphere in regions where the ground is hotter than the air. Retardation by the abstraction of heat at and near a place of maximum pressure; the dying away of atmospheric disturbances in regions where the ground is cooler than the air.

Acceleration by the abstraction of heat at and near a place of minimum pressure; the injector for feeding boilers, in which a jet of steam, being liquefied by the abstraction of heat, is enabled not only to force its way back into the boiler, but to sweep a current of additional water along with it; also, to a certain extent, the ejector-condenser.

The conduction of heat from the parts of a stream where the pressure and temperature are highest to the parts of the same stream where the pressure and temperature are lowest

produces, according to the foregoing principles, a gradual and permanent retardation of the stream, independently of the agency of friction; and this is accompanied by the production of heat to an amount equivalent to the lost energy of flow.—*Pr. British Association.*

REPORT OF THE TIDAL COMMITTEE OF THE BRITISH ASSOCIATION.

In the report of the Tidal Committee of the British Association, Sir William Thomson stated that the chief object of the originators of the investigation was the determination of long-period tides, and particularly the lunar declinational tide and the solar declinational semi-annual tide. The reason for desiring the determination of such tides with great accuracy was that this would give a means of estimating, with absolute certainty, the degree of elastic yielding which the solid earth experienced under the tide-generating influences of sun and moon. It was quite certain that the solid earth did yield to some degree, as it must do so unless it were infinitely rigid. It had long been a favorite assumption of geologists that the earth consisted of a thin shell of solid rock, twenty to fifty miles thick, according to various estimates, inclosing an interior filled with melted material—lava, metals, etc. This hypothesis was, however, untenable, because, were it true, the solid crust would yield with almost as perfect freedom (on account of its thinness and great area) as if it were perfectly liquid. Thus the boundary of the solid earth would rise and fall under the tide-generating influences so much as to leave no sensible difference to be shown by the water rising and falling relatively to the solid, showing that if the earth, as a whole, had an average degree of rigidity equal to that of glass, the tides would be very much diminished from the magnitude corresponding to a perfectly rigid globe, with water like that of our seas upon it. This consideration, he had shown, rendered it probable that the earth had considerably more average rigidity than a globe of glass of the same size. The mathematical calculation showed a somewhat startling result, to the effect that a globe of glass of the same size as the earth, if throughout of exactly the same rigidity as a small glass globe, would yield, like an India-rubber ball, with remarkable freedom to the tide-generating influ-

ences, thus leaving a very much smaller difference to be shown by water if placed on the surface of such a globe, and estimated in its rise and fall relatively to the solid bottom on which it rested. The precise agreement of precession and nutation, with dynamical estimates founded on the supposition of the earth being perfectly rigid, made it probable that the earth was, in reality, vastly more rigid, as a whole, than any specimen of surface rock in the condition in which it is when experimented on in our laboratories. The proposed tidal observation and calculation he considers to be the only method which gives directly, and without any possibly doubtful suppositions regarding interior arrangement of density on the earth, a measurement of its elastic yielding to the tide-generating influences.—15 *A*, *August* 19, 1871, 237.

CROLL ON THE ACTION OF TIDES ON THE EARTH.

Mr. James Croll, well known for his valuable papers upon ocean currents and other physical phenomena, remarks, in *Nature*, upon the discussions which have lately taken place in regard to Sir William Thomson's conclusion, that had the earth solidified several millions of years ago, when it must have been rotating much more rapidly than at present, its form should have been different from what it actually presents; or, in other words, there should have been a much greater difference than now exists between the equatorial and polar diameters. Regarding all the other arguments advanced by Sir William Thomson in regard to the age of the globe as unassailable, Mr. Croll does not agree to the conclusion from tidal retardation, but considers the real objection to the argument to be as follows: as the rate of rotation decreases under tidal retardation, centrifugal force must decrease also. The consequence, therefore, is that the sea must be slowly sinking at the equator and rising at the poles. But denudation is also lowering the land at the equator, and therefore the whole question concentrates itself in this: Will the denudation lower the level of the land at the equator as rapidly as the sea sinks? This question, happily, can be answered. The method lately discovered of measuring the rate of subaerial denudation enables us to determine the rate at which the land at the equator is lowered; and from the principles of mechanics, the rate at which the sea is sinking at the

equator can be determined. By this means it can be shown that the land is being lowered by denudation as rapidly as the sea is sinking, and that, consequently, in so far as this part of the argument is concerned, it can not be inferred, from the present form of the earth, what its form was at the time when the solidification took place.—12 *A*, *August* 24, 323.

DIFFERENCE IN GRAVITY OF ISLANDS AND CONTINENTS.

A preliminary report has been made of certain experiments that have been prosecuted in India with reference to the determination of the intensity of gravity on an island station as compared with that of one inland, or on the continent, in the same latitude. As the result of observations upon an island west of Cape Comorin, we are informed that gravity on the coast was found to be greater than inland, and at an ocean station like Minicoy greater than on the coast.—15 *A*, *August* 19, 247.

OZONOMETRY.

Dr. Moffat stated, at a meeting of the British Association, that ozone test-papers do not become permanently colored in the neighborhood of cesspools, and that the brown coloration, when formed, is removed by the products of putrefaction. He also said that light, the humidity of the atmosphere, and the direction of the wind influence the coloring of the test-paper. Moisture with heat accelerates the chemical action, while a strong wind causes a greater amount of ozone to impinge upon the test-paper in a given time. To counteract the effect of these, he recommends that the test-papers be kept in a box. He described a tube-ozonometer, which he had in use, and gave results obtained by an aspirator ozonometer, and concluded by stating that the results obtained by the latter instrument were not satisfactory.—18 *A*, *Aug.* 25, 562.

RAIN-PRODUCING DISTURBANCE OF THE ATMOSPHERE.

Mr. Laughton, of England, examines in *Nature* the question whether the condition of the atmosphere can be influenced by artificial causes, in the course of which he refers to the assumptions of Professor Espy in regard to producing rain by means of fires, and the oft-repeated assertions that a

heavy cannonade will effect a similar result. After a careful consideration of the subject, he comes to the conclusion that no human agencies can be relied upon to bring about any material change in the atmosphere with any degree of certainty, although he thinks that large fires, explosions, battles, and earthquakes do tend to cause atmospheric disturbance, and especially to induce a fall of rain, but that for such a result it is necessary that other conditions be suitable, especially that the lower portion of the air contain a great deal of moisture.—12 *A*, *Feb.* 16, 307.

MAXIMA AND MINIMA OF THUNDER-STORMS.

In a communication upon the annual distribution of thunder-storms in Austria and Hungary, Dr. Jelinek remarks that from the critical investigations of past years it has been ascertained that in the northern hemisphere there are two minima and two maxima of frequency of such storms. The first minimum occurs in the region north of the polar circle, the second in the region of the trade winds; in both, however, summer storms are rare or entirely wanting. On the other hand, the maxima of frequency of storms occur on the one side in the vicinity of the equator, and on the other side in the temperate zone, and, indeed, they seem to be more frequent to the south of Europe. In illustration of this, he remarks that in Iceland thunder-storms occur almost exclusively in the winter season, and that in the northwest of Scotland the winter storms predominate, although there is sometimes a second maximum in July. The summer storms, on the other hand, are most abundant in Southern and Southwestern Scotland, as well as in France and the rest of Continental Europe. It is considered quite a remarkable fact that Beyrout has quite a similar distribution of storms throughout the year as Iceland. Thus for ten years, during the four months of June to September, not one storm was observed, while in winter more than half the entire number for the year occurred, of which one fourth were in January. Again, while the number of these storms at Beirut seems to be very small, they are still fewer at Jerusalem, only eleven having been observed in the space of three and a half years.—*Sitzungsber. K. K. Akad.*, *Vienna*, LXI.

CLIMATE OF PERU.

Dr. Mühry remarks of the coast of Peru that it presents one of the most interesting exceptions to the general system of terrestrial meteoration, and, as is usually the case in the science of meteorology, that the true explanation of the anomaly is only an additional proof of the soundness of the general laws as established. In the course of his article he remarks that the narrow strip of country, only about fifteen geographical miles in width, lacks the trade wind, rain, and thunderstorms, and is, consequently, a desert, although it is yet very fertile where water is found; and the air is not destitute of moisture, having, indeed, no slight degree of saturation. The temperature is by several degrees too cold for its latitude, and the air is characterized by continued damp fogs, the so-called *garuas*. The reason of this variation from the usual system he finds in the fact that the trade wind blowing from the Andes comes down beyond the coast, which, consequently, is in the lee or the shadow of the wind; and, in addition to this, there is a powerful cold ocean current flowing past it. The trade wind thus does not reach the lower strata of the atmosphere until it gets some considerable distance out to sea, and it is at this point that the rains first manifest themselves. The fog referred to is thought to be due undoubtedly to the cold antarctic current, so that, if the one were not present the other would immediately disappear.—17 *C, March*, 1871, 112.

FORMATION OF CLOUDS.

An English writer, while criticising somewhat unfavorably Professor Poey's new classification of clouds, remarks that in his opinion there are but three ways in which it is possible for clouds to be formed. These are, first, the cooling of a mass of air *in situ* by radiation; this forms *stratus*. Second, the cooling of a mass of air by diminished pressure when it flows in an ascending column; this forms *cumulus*. A modification of the process is when sudden expansion takes place above, so as to diminish the pressure through the entire height of the column of air, and, in consequence of the cold due to the diminution of pressure, produces condensation of vapor throughout the column. This is Espy's explanation of water-

spouts. Third, the cooling of the mass of air by coming into contact with a cooler mass of air than itself; this forms *cirrus.*—12 *A*, *November* 10, 1871, 28.

DIRECT CONDENSATION OF WATERY VAPOR.

Professor Forel, of Lausanne, after long-continued observation, has determined the quantity of water passing the Rhone below the Lake of Geneva, and finds that to furnish this amount it would require an atmospheric precipitation in the basin above of nearly 45 inches. The actual precipitation, however, amounts to but 27½ inches, and the question arises, therefore, whence comes the surplus water? Professor Dufour finds its origin in the direct condensation of the atmospheric vapor on the ice, the cold rocks, and the snow-fields of the Alps. The following experiment may serve to elucidate the principle involved: A vessel containing a cooling mixture of 672 grams weight, on being exposed for an hour in the calm, open air, increased five grams in weight from the vapor condensed on its exterior. Direct measurements at suitable points would be interesting for the purpose of ascertaining approximately what quantity of water is thus actually carried to the river.—*F. C.*, 1871, 179.

INFLUENCE OF TREES ON CLIMATE.

The subject of the influence of "foresting," or the planting of trees, upon the climate of a country, and of "deforesting," or destroying the forest growth, continues to excite much interest throughout the world, as it is now well established that the climate of many localities has been materially altered by one or the other of these processes. Systematic efforts have been made, in different parts of the world, for introducing a growth of trees where these had either disappeared or had never been known, from which important results have followed in many instances. We well know the effect upon the climate of India of planting extensive forests of different species; and we are informed that, as the consequence of a similar experiment, Egypt, which formerly had only about six rainy days every year, since being replanted on a large scale, has already attained to twenty-four. Among the enlightened measures of the administration of the French government, one which is especially noteworthy is that of planting im-

mense tracts of land in Algiers, especially with Australian trees, namely, the *Acacia mollissima* and *Acacia lophantha.* Plantations of these trees, started a few years ago, have attained a height of from nine to twelve feet, and in their rapid growth and great extent have already changed the climate very much—twice as much rain and dew falling in the neighborhood as before. Under the same auspices, sixteen square miles of the swampy, unhealthy country along the coast of the Bay of Biscay, in the department of the Landes, was planted with millions of trees—especially the cork, oak, and swamp pine—with surprisingly beneficial results, the trees having drained the land so as to destroy the swamp fevers, and to change it into a healthy country with pine forests. Biscay law requires that for every tree cut down two shall be planted, and it is said to be executed with rigorous severity.—17 *A, March* 1, 1871, 35.

CYCLES OF TEMPERATURE.

Professor Piazzi Smythe, the eminent Scottish astronomer, endeavors to establish the existence, in addition to the annual cycles of temperature, of three seasons, which he calls supra-annual. One of these corresponds to Schwabe's sun-spot period of a little over eleven years, although it is suggested that this is simply a coincidence, and that the actual occasion of the waves of the terrestrial temperature is to be found in the red prominences of the sun. Another of these cycles is a little more than two years in duration, while the third is about fifty-six years. It is to the effect of these cycles that the so-called changes of climate are believed by Professor Smythe to be due. According to him there is no actual change, only that these cycles in their course bring back the same temperature. Taking a series of observations from 1837 to 1869, Professor Smythe finds that a hot time occurs once in about every eleven years, followed at intervals of a little more than two years by a very cold period; and, arguing from these data, he suggests that the temperature for any season may be foretold a year in advance, and that the past winter in England was the first of a cold cycle, of which the next will probably be exceedingly severe.—2 *B, June* 11, 663.

MOVEMENT OF TEMPERATURE WAVES.

According to Professor Dove, of Berlin, any abnormally low temperature in Europe travels from the east to the west, while any subsequent abnormally high temperature moves from west to east. It is said that these generalizations have been verified by observations extending over almost the whole of Europe and a large portion of the United States of America.—1 *A*, *June* 17, 288.

INCREASE OF TEMPERATURE IN THE MONT CENIS TUNNEL.

According to Professor Everett, the increase of temperature in the Mont Cenis Tunnel amounts to one degree of Fahrenheit to every eighty-one feet of depth of descent, a progression slower in amount than that hitherto observed elsewhere. Mr. Symons has found the increase to be one degree for fifty-four feet at one place in England, while experiments near Paris give one degree for fifty-six feet. In sinking a well in Siberia, although the earth was frozen to a depth of about 700 feet, the increase of temperature was one degree in fifty-two feet.—18 *A*, *August* 18, 537.

DIFFERENCE OF MEAN TEMPERATURE AT VARIOUS HEIGHTS.

The announcement has been made by Mr. Glaisher, the well-known British meteorologist, that the monthly mean temperature of the air at twenty-two feet of elevation is higher than at four feet at all hours of the day and night in January, February, November, and December; in the afternoon and during the night hours in the months of March, April, August, September, and October; and in the evening hours and during the night in the months of May, June, and July. He also states that the mean monthly temperature of the air, at twenty-two feet and at fifty feet, is higher during the evening and night hours through the year than at the height of four feet, and also higher night and day during the winter months.—12 *A*, *November* 10, 1870, 37.

TEMPERATURE OF THE EARTH AT DIFFERENT DEPTHS.

A commission of the British Association has for some years been engaged in collecting evidence in regard to the temperature of the earth at different depths and in different regions.

By some of the observations, the rule heretofore announced in regard to increase of temperature was corroborated, namely, that which fixes it at one degree to about fifty feet, in some instances varying a little in excess or diminution. Attention was called to the interest which would attach to carefully prepared observations made in the great artesian well near St. Louis, which, as is known, reached the depth of 3843 feet, greatly exceeding that of any other well of the kind in the world. Unfortunately, this well is blocked up at a point comparatively near to the surface; and it would involve great expense to open it out again for the purpose of prosecuting special experiments. Mr. Glaisher, on the same occasion, presented some remarks in regard to the temperature of the air at different altitudes, and explained that, although in general the cold increases the higher we ascend in the atmosphere, yet at some seasons, at a certain distance from the earth, the temperature is higher instead of lower than at the surface; furthermore, it was ascertained that at given elevations the thermometer indicated a higher point at night than by day, and he therefore considers that up to 1000 feet the temperature may be occasionally higher instead of lower than at the ground.—8 *A*, *October* 1, 1870, 185.

EVERETT'S SELF-REGISTERING MAXIMUM THERMOMETER.

A new pattern of self-registering maximum thermometer, adapted for use in a vertical position, with a bulb in the top, is presented by Professor Everett in his report on underground temperatures. The contraction in the neck prevents mercury from passing into the stem when the instrument receives moderate concussion. Before taking a reading the instrument must be gently inclined, so as to allow all the mercury in the stem to run together into one column near the neck. On restoring the thermometer to the erect position, the united column will flow on the other end of the tube (that is, the end farthest from the bulb), and it is from this end that the graduations begin. It is set for a fresh observation by holding it in the inverted position, and tapping it on the palm of the hand. This instrument, like that heretofore used, is protected against pressure by an outer case of glass, hermetically sealed.—15 *A*, *August* 19, 237.

FREEZING OF WATER.

In a recent communication to the Academy of Sciences of Paris, M. Boussingault described some experiments showing that water is not liable to freeze, irrespective of the degree of cold to which it is submitted, as long as it is not allowed to expand in order to change into ice. In one instance, water inclosed in a strong steel tube was exposed to a temperature of 8.60 Fahr. without congelation. This, however, occurred instantaneously on unscrewing the steel end of the tube. The fluidity of the water was made manifest by small steel spheres which moved freely inside of the tubes during the whole process, and would have been stopped by congelation.—12 *A*, *July* 20, 1871, 236.

DECREASE IN THE LEVEL OF THE GREAT SALT LAKE.

It is well known that within a few years past the condition of the Great Basin in the interior of North America, in regard to rain-fall, has varied materially, and that the percentage has been much more than heretofore; this fact being well established by the greater increase of the depth in Great Salt Lake, Pyramid Lake, and other localities. Regions which twenty years ago were dry, and occupied by dwellings or roads, are now many feet below the water. At the meeting of the California Academy of Science, held on the 7th of August last, Professor Whitney presented a communication, stating that this rise had been arrested, and that the level of the water was actually descending. Whether this be a permanent change, or whether another alternation will occur, can not, of course, be foretold. It is, however, well established by geologists that the Great Salt Lake at one time occupied its entire valley, and thus was of vastly greater extent than at present.

SMITHSONIAN METEOROLOGICAL PUBLICATIONS.

Among current works likely to constitute a new era in the history of American meteorology may be mentioned a paper by Mr. C. A. Schott, of the Coast Survey, upon the rain-fall in the United States, as prepared and published under the direction of the Smithsonian Institution. These embrace observations for many years past, and constitute, in a measure, the cul-

mination of the long and patient labors in this direction as instituted by Professor Henry, and carried out to their conclusion. The matter, as given in this paper, embraces a series of tables of the daily, monthly, quarterly, and annual rain-fall at numerous stations in North America, with critical discussions of the scientific questions involved, and is accompanied by three maps, prepared with great care, exhibiting the rain-fall for the winter, the summer, and the year. Numerous important generalizations are discussed in this memoir, to which we refer our readers for details.

A paper upon the winds of the northern hemisphere, by Professor Coffin, was published some years ago by the Institution, but a new and entirely revised one is in an advanced stage of preparation. The discussions and generalizations with reference to temperature, barometric pressure, etc., will follow in due succession.

DIFFERENCE IN THE AMOUNT OF RAIN WITH THE HEIGHT.

Mr. Pengelly informs us, as the result of a critical inquiry on the subject, that under unobjectionable conditions, and at the same station, less rain will be received by a rain-gauge high above the ground than by one nearer the surface; second, that the total defect will increase with increase of height; and, third, that the defect will not increase so rapidly as the height.—12 *A*, *June* 29, 1871, 169.

POËY'S NEW FORM OF CLOUD.

Mr. Robert H. Scott, in a recent article in *Nature* upon the forms of cloud, referring to one mentioned by Professor Poëy as quite new to meteorologists, and as having been met with by him on two occasions only, remarks that, according to Dr. Clouston, it is common in Scotland, where it is called the "pocky cloud," and is much dreaded as a prognostication of stormy weather. This he describes as a series of dark, cumulus-looking clouds, like festoons of dark drapery, over a considerable portion of the sky, with the lower edge well defined (as if each festoon, or "pock," were filled with something heavy), one series of festoons generally lying over another, so that the light spaces between resemble an Alpine chain of white-peaked mountains. It is essential that the lower edge be well defined, for a similar cloud, with the lower edge of

the festoons fringed or shaded away, is sometimes seen, and is followed by rain only.—12 *A*, *October* 26, 1871, 505.

PREDICTION OF EASTERLY GALES.

An English writer, in discussing the question of easterly gales, and the methods of foretelling their approach by means of the barometer and otherwise, infers from the observations of the "Quarterly Weather Report" that such gales, so far from coming almost without notice, are preceded by a high barometer and a low temperature, and that an increasing difference of atmospheric pressure between the extreme limits of the British Islands is the danger-signal of the advent, direction, and intensity of all storms. At the southern edge of these easterly gales he states that there always exists a lower barometer than at the northern, and hence the change of the position of low pressure marks out the track of the storm.—3 *A*, *October* 28, 1870, 317.

NEW FORM OF WEATHER-COCK.

A German writer recommends a new form for the construction of weather-cocks, or wind vanes, as being more suitable, and less likely to be moved out of place by slight puffs of wind. The peculiarity of the vane consists in having two wings instead of one, united at an angle of forty-five degrees. —11 *C*, *September* 12, 1870, 249.

CALM IN THE MIDST OF A STORM.

An Austrian meteorological journal contains an account of a very remarkable calm occurring in one portion of an exposed locality while a violent storm was prevailing in every direction round about the section in question. L. Gurlitt, a well-known landscape painter, intending to make a number of sketches on the chalk rocks on the coast of the Danish island Möen, encountered a gale blowing directly in the face of the coast-line, and, failing to receive the shelter which it was expected the trees, shrubs, and gullies would afford, resigned his purpose, and sauntered about the locality with no particular end in view. He was led by curiosity to the very edge of the precipice, and here, to his utter astonishment, he found so perfect a calm that he was enabled not only to execute the proposed drawings, but to lay his papers on the ground

without their being moved by the wind, while at a distance of from twenty to thirty paces in his rear the trees were bending with the force of the gale. He subsequently, again and again, observed this phenomenon when a high wind would strike a vertical rock at right angles. By this he was led to conclude that a mass of air in rapid motion, meeting with an extensive perpendicular obstacle, is forced upward some distance above its upper edge, and then flows over like a water wave, thereby protecting a belt against the direct wind. Professor G. Torchhammer also, repeatedly noticing, in Jutland, that in stormy weather sheep congregated close to the edges of precipices, found a perfect calm prevailing at such points. Another observation would appear to confirm the correctness of the above explanation. A cloud was seen for nearly a whole day hovering on a level with the summits of the rocks of Gibraltar, though during the entire time an easterly gale was blowing, from which it would appear that the upward current created by the resistance of the rocky wall prevented the cloud from following in the direction of the wind.—7 *C*, 1871, 180.

COLD ON MOUNT WASHINGTON.

Among the experiences of the Mount Washington winter-party may be mentioned an exposure to perhaps the greatest cold ever recorded in the annals of science. The temperature was 50°, and to this was added a hurricane blowing at the rate of one hundred miles an hour. The combination of such a wind with the temperature indicated would probably have been entirely unsupportable but for the means of protection enjoyed by the party in the dwelling which had been fitted up expressly for their accommodation.

STORM SIGNALS IN THE UNITED STATES.

It is stated in some of the papers that the system of storm signal observations now in progress under the direction of the Signal Corps of the army was devised by Great Britain before it was made use of by the United States government. This is perhaps correct so far as it goes; but it is to Professor Henry, Secretary of the Smithsonian Institution, that we owe the original idea of procuring dispatches regularly in relation to the weather, and tabulating them, as also of placing

them on a map, so as to show, day by day, the general character of the weather throughout the United States. For several years prior to the beginning of the war this system was carried on regularly, and was of great interest to visitors to the Institution. The occupation of the telegraph lines for military purposes, and the fire in the Smithsonian building, broke up the arrangement; and it was about to be resumed when the government undertook the work, thereby relieving the Institution from the necessity of its further prosecution.

RELATION OF THE BAROMETER TO THE WEATHER.

M. De Fonvielle, an eminent meteorologist, endeavors to show the reason why an increased atmospheric pressure generally accompanies fair weather, and a diminished pressure wet. According to his theory, the dry winds come from the north or northwest, and hence, traveling from a cold region, the air has a tendency to descend, and, therefore, to increase the pressure of the atmosphere, as shown by the rising of the barometer. On the other hand, the winds laden with moisture usually come from the south or southwest, consequently causing a diminished pressure, and a fall of the barometer.—13 *A*, *February* 1, 1871, 121.

METEOROLOGY OF THE NORTH ATLANTIC.

A report has just been published in Bremen of the meteorological and physical conditions attendant upon the voyages of the North German steamers between New York and Bremen during 374 passages. From this it appears that floating ice is met with principally between the meridians of 46 and 51, and is more abundant east of that region than west of it. The general direction in which the storms blow is said to be between west and north-northwest; also, that fifty per cent. of the entire number occurred during November, December, and January; twenty-six per cent. during February, April, and October; twelve per cent. during March and September; and the remainder distributed over the remaining four months, from May to August. They reach a maximum at 30° west longitude, and maintain it to 45° west, their direction being northwesterly. From these facts, Von Freeden, the author of the article, concludes that the storms begin in the neighborhood of the Banks of Newfoundland, where the

cold arctic current meets the warmer waters of the Gulf Stream, and that they are not West Indian hurricanes crossing the Atlantic from shore to shore.—16 *A*, *April*, 1871, 282.

STORM-SIGNAL STATION IN THE AZORES.

Dr. Buys Ballot, the eminent director of the Meteorological Observatory of Utrecht, has been lately urging the Portuguese government to establish a station in the Azores, to be connected with the general system of European meteorological observatories by a submarine cable which will shortly be laid in that direction. By the reports of southwestern gales that can be obtained in this way, it is expected that an ample premonition of their approach can be given to the British Islands and Western Europe. This will greatly improve the system of weather forecasts as now attempted in Europe, and make them approach more nearly in accuracy to those of the United States Signal Corps, which have astonished every one by their reliable indications. This accuracy is due to the fact that most changes in the weather begin in the west and extend eastward; and the greater the distance to the westward over which such observations can be made, the more time will be given, of course, toward the east to prepare for the impending changes.—12 *A*, *June* 22, 1871, 156.

DETERMINATION OF HEIGHTS BY THE BAROMETER.

Professor J. D. Whitney, in a recent communication to the Academy of Sciences of San Francisco upon the use of the barometer in determining altitudes, remarked upon the effect which temperature exerts upon the instrument, and stated that the difference between the cold of winter and the heat of summer would sometimes, in the same instrument, involve a difference in the estimate of a given height of as much as seventeen feet. He hoped in time to have tables prepared which should give the allowances that must be made for each day of the year, and for different times in the day, an observation at 9 A.M. sometimes giving a different result from one taken at 2 P.M. at the same altitude on the same day. He also expressed his dissatisfaction with the aneroid barometer as a means of measuring altitudes, although he had experimented with the best that were offered in the market. He found them reliable for a certain time only, and they appeared

to have spells of irregularity from which they recovered very slowly. He did not find any upon which he could rely for heights above 1000 feet.—*Proceedings Cal. Academy.*

ANEROID AND MERCURIAL BAROMETERS.

In a comparison of the aneroid and mercurial barometers, made throughout a recent voyage across the Atlantic, it was ascertained that the ordinary indications were the same in both instruments, but that the aneroid was to be considered as more sensitive to atmospheric changes. It always indicated the approach of foul weather, or the change to fair, in advance of the rival instrument.—8 *A, December*, 1870, 224.

COMPARATIVE FREQUENCY OF THUNDER-STORMS.

From a table by Dr. Klein, showing the mean annual frequency of thunder-storms in different localities, Java appears to be the most favored in this respect, one locality being credited with 159 storms, and another with 110. Beyrout, in Syria, can count only four, while Sitka has an average of only one and a half per annum, as shown by a period of nine years.—17 *C*, no date.

METEOROLOGICAL PHENOMENA IN CHILÉ.

An unusual phenomenon was witnessed lately at Serena, in Chilé, on the 7th ult., due to the reflection of the sun on some masses of clouds which extended in the form of *cirro cumuli* along the Bay of Coquimbo. The sun's disk was seen somewhat opaque in the centre of a great cloud of a fine golden color, along the edges of which were seven more disks of a brighter golden tint appearing as satellites around the setting orb. In the lower part of the cloud the image of part of the Bay of Coquimbo was reflected, as if seen in a gigantic mirror. The phenomena were visible for the space of seventeen minutes, when they sank gradually below the horizon, like fugitive stars in the ocean.—*Panama Star and Herald, November* 2, 1871.

CLIMATE OF MICHIGAN.

Professor Winchell, in a late magazine article upon the climate of Michigan, adduces figures to show that while the July climate of Michigan is cooler than that of Wisconsin

and Minnesota, the growing season begins on the western side of the state thirteen days earlier in the spring than it does at Milwaukee, nearly opposite, and continues from five to eight days later in the autumn; a still greater contrast being appreciable if localities in the interior of Wisconsin be selected. The extreme cold of Grand Haven, Michigan, too, is 14° higher than that of Milwaukee, the difference, according to Professor Winchell, being all that distinguishes between a fruit-bearing region and one in which fruits fail.

DOES THE MOON EXERCISE ANY INFLUENCE ON THE WEATHER?

A paper has been recently published by Streintz upon the question whether the moon exercises any appreciable influence upon meteorological phenomena, based upon a discussion of twenty years' observation at the Greenwich Observatory. He gives it as the result of his investigations that the moon, in our latitude, exercises *no* influence upon the barometer, upon rains, nor upon the wind, which can be appreciated by the most careful observation within the last twenty years; and that if any such influence occur, it must be extremely slight.—18 *C*, XXXIII., *August* 16, 1871, 513.

SALT AND PYRITES IN HAIL-STONES.

The transportation of sand from Africa to Italy, France, and the Canaries by means of hurricanes has frequently been observed and referred to in scientific journals; but a transfer of salt, as recently reported to have taken place in Switzerland, is perhaps a more unusual phenomenon. According to Professor Kenngott, of Zurich, a hail-storm lasting five minutes occurred at eleven o'clock in the morning of the 20th of August, 1870, the stones from which were found to possess a salty taste. Some of them weighed twelve grains. They were found to consist essentially of true salt, such as occurs in Northern Africa on the surface of the plains, mainly in *hexaedric* crystals or their fragments, of a white color, with partly sharp and partly rounded grains and edges. None of the crystals were entirely perfect, but appeared as if they had been roughly developed on some surface. There seems little doubt but that their source was precisely the same as that of the sand, having been taken up and brought over the Mediterranean Sea from some part of Africa.

A still more remarkable phenomenon has been recently recorded by Professor Eversmann, of Kasan—namely, the occurrence of hailstones each containing a small crystal of sulphuret of iron. These crystals were probably weathered from some rocks in large quantity, and were then taken up from the surface of the ground by a storm, and, when carried into the hail-forming clouds, served as a nucleus for the formation of hailstones.—3 *C*, *June* 26, 1871, 618.

TEMPERATURE OF THE EARTH IN THE MONT CENIS TUNNEL.

Advantage has recently been taken of the borings in the Mont Cenis Tunnel to ascertain the interior temperature of the earth, the experiments being instituted at a point in the tunnel which was situated five thousand four hundred feet from the surface. Here special borings were made to a depth of ten feet in lateral excavations, which were closed for a considerable period of time after the instruments were inserted. The temperature observed at this point was a little over $82\frac{1}{2}°$ Fahr.—7 *C*, 1871, 304.

INFLUENCE OF BAROMETRIC PRESSURE ON TIDES.

Dr. Carpenter, in a late communication to *Nature*, calls attention to the neglect, in the late discussions upon the ocean currents, of published observations made upon the influence of variations of barometric pressure upon the sea-level. In this connection he remarks that, according to one author, a fall of one inch in the barometer is pretty uniformly accompanied by a rise of the sea-level to about thirteen times this amount, or thirteen inches; and another makes the ratio to be about one to thirteen and a half inches, this being subsequently corrected to about twelve and three fourths inches. Dr. Carpenter thinks that this relationship of barometric pressure to the height of the tides may serve to explain a number of anomalous phenomena that have perplexed observers, especially with reference to unusual rises of tide, and their retention at a high level longer than customary.—12 *A*, *April* 20, 1871, 481.

RELATION OF RADIATION IN THE TROPICS TO ZODIACAL LIGHT.

M. Galliard, of Guadaloupe, states, as the result of numerous and exact observations, that between the tropics radia-

tion appears to exist in a constant relation to the density of the zodiacal light; or, in other words, that its light is a screen, which, by its relative opacity, arrests a portion of the heat emitted by the sun. This fact is, he says, placed beyond a doubt by a long series of thermometrical observations compared with the observations of the density of the zodiacal light.—3 *B*, *September* 7, 1871, 524.

BLUE COLOR OF LAKE WATER.

We have already made some reference to the observations of Professor Tyndall in regard to the cause of the blue color of the Lake of Geneva, and to his ascribing it to the presence of solid particles of extreme fineness suspended in the water. The researches of Professor Tyndall, and of Professor Loret on the same subject, have been reproduced by Professor Delafontaine, of Chicago, and lately presented before the Academy of Sciences of that city. As the result of his observations, he stated that common water, when crossed by a beam of light, becomes illuminated, and assumes a blue color, polarizing the light in the same way that air does, and that it loses this property on having undergone a complete purification by the removal of solid matter suspended in the liquid. His experiments were tried upon the Chicago River water in its natural state, which exhibited great illuminating power even after a rest of several weeks. By first filtering and then carefully distilling the same water, with the aid of permanganate of potash, for the purpose of removing the organic matter, he found that it lost almost the whole of its power of illumination.—*Chicago Times*, *December* 14, 1870.

PHYSICAL ATLAS OF FRANCE.

An important work has just been commenced in France, under the direction of Messrs. Delaunay and Marié Davy, with the title of "Physical Atlas of France," a specimen number having been issued by these gentlemen for the criticism of their friends and correspondents. The scale on which most of the maps are to be executed is two millionths of an inch, which is thought to be sufficiently large to allow a representation of the different elements to be included. The subjects treated of in this atlas will be classified under six different heads: first, the political administrative condition of France,

such as the ancient and modern divisions into provinces, departments, judicial districts, university and military districts, etc.; second, the soil and the waters of France, such as maps of the bottom of the sea, of the flora and marine fauna of the coast, relief maps of the soil and water-courses, general and special geological maps, etc.; third, the climatology of France, showing the lines of equal temperature, rain and wind maps according to the season, maps of storms, hail, etc.; fourth, the agronomy of France, such as maps of geographic botany, of the leafing, flowering, and fructification of plants, maps showing the condition of culture, the portions occupied by woods, sterile patches, meadows, etc., maps of natural and artificial irrigations, etc.; fifth, the industry, commerce, and navigation of France, including maps of telegraphic and postal lines, of railways and canals, and showing the distribution of the different industries, as well as maps of the mineral and manufacturing productions. The sixth and last division is that of population, including ethnology and archæology, maps of the density of the population, of the price of daily labor, maps of primary, secondary, and superior instruction, of the prisons, the endemic maladies, the size of the conscripts, etc.

The specimen number of this work relates to the navigable waters, and how far they are navigable from the sea for war or other vessels, the amount of water at the different seasons, their industrial utilization, the amount disposable for agriculture and the amount actually used for irrigation, the mineral composition of the waters, etc. Also the relief of the bottom of the sea, and the composition of its bottom in reference to navigation; and the mineral, animal, and vegetable productions found at the bottom of the sea, and the places of their production; the sedentary and nomadic population, who occupy their time in fishing; the position of light-houses and life-saving stations, etc.—3 *B*, XXVI., *October* 26, 1871, 213.

PENDULUM EXPERIMENTS IN INDIA.

We have already referred to the pendulum experiments carried on by Captain Basevi in India, having for their special object the determination of the mass of the earth in that region, and we regret to hear of the untimely interruption of these important observations by the death of this accomplish-

ed physicist. As far as the results of his labors are known, it would appear that the local variations of gravity which are superposed on the great law of increase from the equator to the poles, though apparently irregular when examined singly, are subject to laws which are highly interesting and curious, and are well worthy of investigation. At the northern extremity of the arc the results indicate a deficiency of density as the stations approach the Himalayan Mountains, while at the southern extremity they show an increase of density as the stations approach the ocean: thus both groups of results point to a law of diminution of density under mountains and continents, and an increase under the bed of the ocean.

While this applies to altitudes of seven thousand feet and under, it remained to determine the conditions at greater heights, and arrangements were made to experiment on some of the table-lands of the interior of the Himalayas fourteen thousand to seventeen thousand feet in height. After this was done, the pendulums were to be taken back to England, and swung at the base stations of Greenwich and Kew, stopping at Aden, on the Suez Canal. In this way the gravity at Aden would be directly compared with that at certain points of the coast and continental stations of the Indian peninsula, while the plains of Egypt would be compared with the Himalayan Mountains. In the prosecution of this research, Captain Basevi reached a spot in Ladak where, at an altitude of fifteen thousand five hundred feet, he completed a satisfactory series of observations, which show a very gross deficiency of density. After applying the usual reductions to sea-level, etc., it was found that the force of gravity at that point did not exceed the normal amount for the parallel of six degrees to the south, as determined by previous observations with the same pendulums.

Wishing to have one more independent determination at a high altitude, Captain Basevi continued his journey to a point on the borders of the Chinese territories at an altitude of about sixteen thousand feet. Here, however, his labors were abruptly closed by disease, which had been impending for some time, and but a short period elapsed before his death occurred.

C. ELECTRICITY, LIGHT, HEAT, AND SOUND.

PHOTOGRAPHING MAGNETIC CURVES.

Professor A. M. Mayer, of Lehigh University, has devised an ingenious method of fixing, photographing, and exhibiting the magnetic spectra. For this purpose he takes a clean plate of thin glass and coats it with a film of shellac, formed by flowing over it an alcoholic solution of this substance just as the photographic print is coated with collodion. After the plate has remained a day or two in a dry atmosphere, it is placed over a magnet or magnets, with the ends resting on slips of wood so that the under surface of the plate just touches the magnet. Fine iron filings are now sifted uniformly over the film of lac by means of a fine sieve. The spectrum is then produced, on vibrating the plate, by letting fall vertically upon it, at different points, a light piece of copper wire. The plate is now cautiously lifted off the magnet, and brought quite close to the under surface of a cast-iron plate which has been well heated. Here the shellac is softened uniformly, and the iron filings sink into the film, and are fixed. The heat should be allowed to continue until the metallic lustre of the filings has disappeared by sinking into the shellac, and the film appears quite transparent. After the plate is cooled, any superfluous filings are knocked off by inverting and gently tapping it. These plates may then be used either as permanent objects of exhibition, or as negatives from which to print, in the usual way, an accurate representation of the foci, lines of direction, etc. They can also be used as slides for a magic lantern.—*Am. Jour. Sci.*, *April*, 1871, 260.

DUCHEMIN'S ELECTRIC PILE.

M. Duchemin has recently presented to the notice of the French Academy of Science a new electrical pile, which is so arranged that, on being placed in contact with the sea, it instantly becomes a source of electricity, by means of the oxidizing of the liquid which surrounds it, as well as by agitation and perpetual renewal. His model consisted of a per-

forated vase, placed on a cross-piece of wood and supported on a float. This vase is protected by a cylinder made of thick zinc, and pierced with holes, the stem of which represents the negative pole. In this vase is placed a piece of carbon, on top of which the positive conductor pole is placed. This piece of carbon is surrounded by fragments of coke and perchloride of iron, and the top of the vase is suitably closed. Under the influence of the salt water the zinc decomposes the liquid, the hydrogen passes to the perchloride, and the electricity is thus exhibited in a very appreciable form.—7 *A*, *June* 15, 535.

NEW SALT FOR ELECTRICAL BATTERIES.

A French chemist, M. Etéve, has patented a composition of the double acetate of iron and potassa, for the purpose of producing very intense electrical currents, and intended especially as a substitute for nitric acid, which, as is known, produces very disagreeable nitrous vapors. For this purpose, one part, by weight, of the sulphate of iron, and the same quantity of the nitrate of potassa, are dissolved in a proper quantity of the acetic acid of commerce, the solution being aided by a slight degree of heat. The crystals which form on cooling are to be collected, washed, and dried in the stove. —4 *B*, *August* 1, 747.

GALVANIC ELEMENT WITH ONE LIQUID.

A galvanic element with one liquid, as recently announced, consists of a galvanic cell, composed of zinc and carbon, placed in a fluid made up of 40 parts of water, 4.5 of bichromate of potassa, 9 parts of concentrated sulphuric acid, 4 parts of sulphate of soda, and 4 parts of the double sulphate of potassa and iron, this producing a very regular current. It is said that the zinc need not be amalgamated, and that no gas is evolved.—5 *A*, *October*, 1870, 446.

ELECTRO-DEPOSITED IRON.

According to Dr. Klein, iron obtained by galvanic deposit is not the pure metal, as generally supposed, but is a mixture of iron and hydrogen, which, when heated to redness, gives off an enormous amount of the gas, and, while greatly increasing in bulk, becomes a silver white, very soft, ductile,

and malleable metal, which decomposes water readily below the boiling point, and oxidizes very rapidly. — 1 *A*, *September* 23, 155.

IMPROVED ELECTRIC AMALGAM.

It is well known that a deposit of moisture greatly interferes with the action of electrical machines, experiments often wholly failing from this cause, especially in the winter season. Mr. F. Dietlen, of Klagenfurt, has devised a method by which he obviates this difficulty, consisting simply in a modification of the amalgamation of the rubber cushion. For this purpose he pours petroleum over zinc filings, and adds an equal quantity of mercury (though an excess of mercury facilitates the process). The mixture is then brought, by working together in a mortar, to the condition of a homogeneous paste, and pressed between a double cloth. A soft mass is thus obtained, which, however, soon hardens; but which, being finely pulverized and mixed with a proper quantity of grease, is spread upon the rubber cushion. This makes the surface quite glossy, and, when the glass disk has previously been wiped with a piece of cotton slightly impregnated with petroleum or benzine, will act even in damp localities where the usual arrangement fails.—9 *C*, 1871, III., 20.

DEVELOPMENT OF OZONE BY THE BATTERY.

Professor Boettger informs us that if a solution of nitrate of bismuth be decomposed by the galvanic current, an uncommonly large amount of ozone is developed at the pole connected with the platinum element, while the platinum itself becomes coated with a layer of superoxide of bismuth at the same time. By a similar treatment of a silver or lead salt there is a like deposit of superoxide of these metals, but without any special development of ozone.—15 *C*, 1871, XX., 320.

CELESTIAL ORIGIN OF POSITIVE ELECTRICITY.

M. Becquerel has recently presented a memoir to the Academy of Sciences of Paris upon the celestial origin of atmospheric electricity, or rather of the positive electricity distributed in enormous quantities in the planetary spaces. This he finds in the hydrogen electrized positively which escapes continually from the sun. According to modern observa-

tions the solar spots are in reality cavities, by which the hydrogen, and the various substances composing the solar atmosphere, escape from the photosphere, this hydrogen being the result of a decomposition, bringing with it positive electricity, which is distributed in the planetary spaces, diminishing in intensity more and more toward the earth, in consequence of the poor conducting power of the more and more dense strata of the air, and of the superficial crust of the earth, this latter being negative only because it is less positive than the air.

For this electricity to be propagated in any medium, some substance is necessary as a vehicle; and it is established, in fact, that the luminous properties of electricity belong in a great degree, if not entirely, to the ponderable matter across which the electric discharges are transmitted. The auroras result from the discharges of this electricity, thus explaining, according to M. Becquerel, the rustling or crackling sound heard by the inhabitants of the polar regions. This occurrence, although apparently well attested, has been denied by some; but the experience of M. Rollier, the intrepid aeronaut who was carried in his balloon last December from Paris to Norway, and landed upon a snow-covered mountain 10,000 feet high, confirms this view. This gentleman remarks, in his report of the voyage, that while passing through a thin fog he perceived the brilliant rays of an aurora tinging every thing with its strange light. Very soon a curious and incomprehensible roaring was heard; but this, after a time, ceased entirely, with the development of a decided odor of sulphur, which was almost suffocating.—3 *B*, 1871, *August* 10, 172.

DURATION OF VISION.

Professor Ogden N. Rood, of Columbia College, in a late number of *Silliman's Journal* has an article upon the amount of time necessary for vision, and refers to an experiment of Wheatstone, which seems to show that distinct vision is possible in a period of less than one millionth of a second. He, however, refers to experiments of his own, by which electric sparks were produced whose duration was only the forty billionth part of a second; and yet, during their continuance, the letters on a printed page were plainly to be seen; and in polariscope observations the cross and rings around the axis

of crystals could be appreciated, with all their peculiarities. He thinks, however, that while this period is sufficient for the production of a strong and distinct impression upon the retina, a smaller interval will suffice for many purposes, and that four billionths of a second, and, perhaps, even a shorter time, may be sufficient. This, according to the Professor, is not so wonderful, if we accept the doctrine of the undulatory theory of light, as, according to it, in four billionths of a second nearly two and a half millions of the mean undulations of light reach and act upon the eye.—4 *D*, *September*, 1871, 155.

INFLUENCE OF LIGHT ON PETROLEUM.

According to recent researches, petroleum, when exposed to solar light, absorbs oxygen and changes it into ozone, although this does not combine with the oil, the ozone remaining free, and oxidizing every thing with which it comes in contact. Petroleum oils impregnated with ozone have a totally altered smell, burn with more difficulty, and attack the cork stoppers of the vessels very strongly. If the vessels are of glass, their color exercises much influence upon the absorption of oxygen by the petroleum. Thus petroleum oils, when exposed in white glass to solar and daylight, become yellow and impregnated with ozone, assuming a greater specific gravity, and losing their ready combustibility. This is said to be especially the case with American petroleums. The practical inference may therefore be deduced that petroleum intended for burning should be kept in stone or metal vessels, or, if in glass, protected as much as possible against the influence of daylight.—13 *C*, 1871, *August* 11, 1151.

SPECTRUM ANALYSIS OF BLOOD.

Mr. H. C. Sorby, well known for his skill in spectrum analysis, in reply to certain expressed doubts, maintains that there is no better way of determining the existence of blood, under any given circumstances, than its examination by means of the spectroscope. The absorption bands are perfectly distinct and well defined, and, indeed, so marked that a stain containing less than one hundredth of a grain can be recognized even after the lapse of fifty years. In this assertion he does not wish to be understood as stating that human blood can be thus definitely distinguished from that of other

animals, but simply blood as compared with other animal and vegetable coloring substances.—20 *A*, *June* 10, 658.

DIFFUSION OF LIGHT BY FUCHSINE.

Mr. Christiansen was the first to ascertain that the dispersion of light by fuchsine is different from that of other bodies. Mr. Kundt has since discovered that nearly all bodies which in the solid state show a well-defined surface color have an abnormal dispersion spectrum when examined in the form of a concentrated solution. In fuchsine, aniline blue, aniline green, indigo, indigo carmine, carthamine, murexide, cyanine, hyper-manganate of potash, and in carmine, the red light is more dispersed than the blue; and in bodies with green in their surface color, the green in the spectrum is least deflected. Thus cyanine, aniline violet, aniline blue, and even indigo carmine, give the colors as follows: green, blue, red—the green being least deflected.—19 *C*, xx., 162.

THE SPECTROSCOPE FOR TESTING THE PURITY OF WATER.

Professor Church, of Cirencester, has lately applied the spectroscope to excellent advantage in determining the question of infiltration of sewage into water. In one instance, where several cases of typhoid fever had been developed in a particular neighborhood, which it was suspected had been caused by the use of water contaminated by drainage from a urinal, a few grains of a lithium salt were introduced into the urinal. Two hours after, a spectroscopic examination of the well-water referred to showed unmistakably the presence of lithium, while previously no traces of its existence had been found under the same treatment.—1 *A*, *December* 30, 322.

ILLUSTRATION OF FLUORESCENCE.

Professor Flückiger, of Berne, has recently detailed a method of preparing a liquid which exhibits the phenomenon of fluorescence to a very remarkable degree. If one drop of nitric acid be added to about seventy of the essential oil of peppermint, and the two thoroughly shaken together, the fluid turns to a faint yellow color, and then becomes brownish. After an hour or more it assumes a brilliant blue-violet, or greenish-blue, when examined by transmitted light. Seen by reflected light, the liquid is of a copper color, and not transparent.—6 *A*, *April* 29, 527.

BLUE COLOR OF LAKE AND SEA WATER.

Professor Tyndall has recently been investigating the cause of the blue color of the water of the Lake of Geneva, specimens having been transmitted to him for the purpose. He finds that this color is caused, as had previously been suggested, by the presence of small mineral particles, probably derived from glacier dust (brought into the lake by drainage from glacier streams), of such extreme minuteness as not to settle even when the water is allowed to stand for a long time. Professor Tyndall furthermore states that not only is the light mainly blue from the first moment of its reflection from the minute particles, but the less refrangible elements which always accompany the blue are still further abstracted during the transmission of the scattered light by true molecular absorption. These two causes, scattering and absorption, he considers sufficient to account satisfactorily for the exceptional blueness of both the Lake of Geneva and of the Mediterranean Sea.—12 *A*, *October* 20, 487.

BOILING POINT OF UNMISCIBLE LIQUIDS.

Mr. Kundt announces in Poggendorff's "Annalen" that where two liquids having different boiling points are brought together, that do not combine with each other, as, for example, water and benzole, water and oil of cloves, water and sulphide of carbon, etc., they will boil at a lower temperature than when the more volatile of these liquids is brought to ebullition by itself. This fact may be placed side by side with that lately published, that a liquid having a boiling point higher than that of water can be brought to boil by steam applied through pipes in a suitable manner.—1 *A*, *October* 14, 191.

ACOUSTIC PHENOMENA ON MOUNT SINAI.

Captain Palmer gave an account to the British Association of a remarkable acoustic phenomenon on a certain mountain in the peninsula of Mount Sinai, from which loud and mysterious noises are frequently known to proceed. This mountain is a peculiar sand-slope, about two hundred feet high, and nearly triangular in shape, eighty yards wide at the base, narrowing toward the top, where it runs off into three or four

small gulleys. Sandstone cliffs bound it on each side. The sand is of a pale yellowish color, and is so pure and fine, and so perfectly dry, and at the same time lies at so high an angle (nearly 30°) with the horizon as to be set in motion by the slightest cause. When any considerable quantity is thus in motion, rolling slowly down the slope like some viscous fluid, then the singular acoustic phenomenon is heard, from which the mountain derives its name—at first a deep, swelling, vibratory moan, rising gradually to a dull roar, loud enough when at its height to be almost startling, and then as gradually dying away till the sand ceases to roll. Captain Palmer states that it is difficult to describe this sound exactly. It is not metallic, nor like the sound of a bell, nor yet that of a gong; perhaps the very hoarsest note of an Æolian harp, or the sound produced by rubbing the wet rim of a deep-toned finger-glass most closely resembles it, except that the rolling sand has less music in it. It may be likened to the noise produced by air rushing into the mouth of an empty metal flask or bottle, sometimes almost approaching the roar of thunder, and then resembling the deeper notes of a violoncello or the hum of a humming-top. In the course of two days' experiments, Captain Palmer ascertained that the hot surface-sand was always more productive of sound than the cooler layers underneath, the hot particles appearing to run more quickly than the cold.—15 *A*, *August* 19, 246.

NEW FORM OF SENSITIVE FLAME.

Some of our readers are familiar with the interesting physical fact that certain flames are exceedingly sensitive to sound, and have seen notices of the experiments of Professor Tyndall and Professor Pepper, in London, upon this subject. Quite recently, according to *Nature*, a new form of sensitive flame has been devised by Mr. Barry, of Cork, which is said to be the most easily affected one known, possessing the advantage that the ordinary pressure in a gas-main is quite sufficient to develop it. The method of producing it consists in igniting the ordinary coal-gas, not at the burner, but some inches above it, by interposing between the burner and the flame a piece of wire gauze of about thirty-two meshes to the inch. A pin-hole burner is used, so as to produce a conical flame.

The gauze should be held steadily about two inches above the burner, by means of a retort-stand. The flame is a slender cone about four inches high, the upper portion giving a bright yellow light, the base being a non-luminous blue flame. At the least noise this flame roars, sinking down to the surface of the gauze, becoming at the same time almost invisible. It is very active in its responses, and being rather a noisy flame, its sympathy is apparent to the ear as well as to the eye.

To the vowel sounds it does not seem to answer so discriminately as the vowel flame of Professor Tyndall. It is extremely sensitive to *a*, very slightly to *e*, more so to *i*, entirely insensitive to *o*, but slightly sensitive to *u*. It dances in the most perfect manner to a small musical snuff-box, and is highly sensitive to most of the sonorous vibrations which affect the vowel flame, though it possesses some points of difference.—12 *A*, *November* 9, 1871, 30.

HEAT OF COMBUSTION OF STONE-COAL.

In a careful inquiry upon the heat of combustion of stone-coal by Scheurer-Kestner and Meunier, the conclusion was reached that during the formation of coal a certain quantity of heat must have been absorbed, since the theoretical heat of combustion was always less than that actually observed. In our entire ignorance of the constitution of coal, it is impossible, however, according to the authors, to determine the nature of this absorption. It would furthermore appear that, from our want of knowledge of the composition of coal, we can not calculate the heat of combustion. Two coals of precisely the same chemical composition may and do afford very different degrees of heat in combustion.—18 *C*, XXXIII., *August* 16, 1871, 523.

ON HEAT EVOLVED IN THE FORMATION OF AQUEOUS SOLUTIONS.

In a memoir by Mohr upon the heat evolved in the formation of aqueous solutions, it is stated that the fall of temperature occasioned by the solution of salt in water, or by mixing salt with snow, is to be ascribed to a change in the state of aggregation. Referring, however, to the fact that a fall of temperature is observed when an aqueous solution of com-

mon salt is mixed with an additional quantity of water, when no liquefaction takes place, he remarks that this explanation does not account for the loss of heat, but that part of the heat disappears and becomes latent, or enters the body in such a manner as to give rise to a new and permanent quality, namely, lower freezing-point.—21 *A*, IX., *July*, 1871, 475.

OPPOSITE CURRENTS OF ELECTRICITY.

It is stated by the London *Athenæum* that Mr. C. F. Varley, the well-known electrician, has devised a method by which four currents of electricity can be delivered simultaneously by a single wire, even in opposite directions.

ACTION OF MAGNETISM ON GASES TRAVERSED BY ELECTRICAL CURRENTS.

In a paper by MM. A. de la Rive and E. Sarasin, in the *Bibliothèque Universelle*, the following conclusions are announced as the result of a long series of experiments upon the action of magnetism on gases traversed by electrical currents: 1. The action of magnetism exerted upon a portion only of an electric jet traversing a rarefied gas causes an augmentation of density in this portion. 2. This action exerted upon an electric jet placed *equatorially* between the poles of an electro-magnet produces in the rarefied gas an augmentation of resistance proportional to the conductivity of the gas itself. 3. On the contrary, it causes a corresponding *diminution* of resistance when the jet is axially between the two magnetic poles. 4. When the action of the magnetism is to impress a continuous movement of rotation upon the electric jet, it has no influence upon the conductivity if the rotation be in the plane perpendicular to the axis of the iron cylinder detaining the rotation, and diminishes it considerably if the rotation takes place so that the jet describes a cylinder round the axis. 5. These effects do not seem to be due to variations of density, but to perturbations in the arrangement of the particles of the rarefied gas.—12 *A*, *July* 20, 236.

D. CHEMISTRY AND METALLURGY.

ALUMINIUM FOR SMALL WEIGHTS.

Dr. Phipson recommends very warmly the employment of aluminium in the manufacture of very small weights. The advantages, as set forth by him, are their immunity from the inconvenience attaching to the use of brass weights in a chemical laboratory, in retaining their brilliancy untarnished, and in not losing their value by oxidation. The much greater bulk occupied by a given weight, as compared with brass or other metal, enables one to handle them much more readily, and a considerably smaller weight can be used, without inconvenience, than has been generally thought practicable in such cases. A set used by Dr. Phipson contains fourteen weights, from half a gramme to one and a half milligrammes, the latter (less than the one fortieth of a grain) not being very easily handled when made of any other metal.—1 *A*, *October* 14, 187.

RUSTING OF IRON.

Professor Calvert, after repeated experiments, has found that pure dry oxygen does not determine the oxidation of iron, and that moist oxygen has but feeble action; also that dry or moist pure carbonic acid has no action, but that when moist oxygen containing traces of carbonic acid is brought into contact with iron, the latter rusts with great rapidity. He concludes, therefore, that carbonic acid is the agent which determines the oxidation of iron, and that it is the presence of carbonic acid in the atmosphere, and not its oxygen or its watery vapor, that produces the oxidation of iron exposed to common air. In one experiment he found that if clean blades of the best quality of iron be placed in water which has been well boiled, and deprived of its oxygen and carbonic acid, they will not rust for several weeks; and that if a similar blade be half immersed in a bottle containing equal volumes of pure distilled water and oxygen, the portion dipping in the water becomes rapidly oxidized, while the upper portion remains unaltered. But if to the atmosphere be added some

carbonic acid, chemical reaction on the exposed portion, with rapid oxidation, takes place immediately.

In reference to the fact, first published by Berzelius, that caustic alkalies prevent the oxidation of iron, he remarks, as the result of special experiments on this subject, that the carbonates and bicarbonates of the alkalies possess the same property as their hydrates; and that if an iron blade be half immersed in a solution of such carbonates, they exercise such a preservative influence on that portion of the bar which is exposed to the atmosphere or common air (oxygen and carbonic acid) that it does not oxidize even after a period of two years.—1 *A*, *March* 3, 98.

HYDRATE OF CHLORAL FOR REDUCING METALS.

Hydrate of chloral may in many cases, according to a German pharmaceutical journal, be conveniently applied to the reduction of precious metals. For this purpose a solution of gold, platinum, etc., is mixed with hydrate of chloral and an excess of caustic potash or soda, and the whole heated together. After boiling for about one minute the reduction is complete, and the precipitate is easily washed. In the case of silver the action is especially satisfactory, but solutions of salts of mercury are not reduced.—14 *C*, 1871, VI., 513.

REDUCTION OF NATIVE SULPHIDES.

Native sulphides of metals often occur of much value in a metallurgical point of view, but which can not be reduced in consequence of the great scarcity of fuel. Dr. Kopp, in a recent paper, mentions the results of a series of experiments upon such substances, for the purpose of ascertaining whether certain cheap and abundant chemical reagents can be made to act upon the minerals in question (without at the same time affecting their gangue), so as to bring them into a condition fit for being readily converted into metals. The reagents named as suitable for the purpose in question are common salt, chloride of iron, and hydrochloric acid. In this paper it is stated that the most economical method of extracting the small quantity of copper present in previously burned pyrites consists in first exposing the burned substance to heat and moisture, and then pouring over the material a solution of common salt. A small addition of hydrochloric

acid is useful, and the copper in this way becomes converted into a soluble chloride.—5 *A*, *October*, 1870, 424.

REDUCTION OF ORES BY CHLORIDE OF IRON.

A method of reducing ores by means of chloride of iron has recently been patented, which is specially adapted to the extraction of metals alloyed with sulphur, arsenic, or antimony. The process depends upon the fact that chloride of iron, in the presence of air and water, readily decomposes sulphur, arsenic, and antimonial combinations, iron or copper pyrites, the sulphurets of cobalt, nickel, sulphuret of antimony, lead, silver, etc. The chloride of iron is reduced to chloruret of iron, and the metals transferred into chlorides, the chloruret of iron being again changed to chloride by the influence of the oxygen of the atmosphere, etc. If among the ores to be manipulated there be too little sulphur, it is well to add, from time to time, a little free acid, such as nitric, in order to assist the reconstitution of the chloride of iron. With iron or copper pyrites it is only necessary to add common salt, since the sulphur of the ore is oxidized by means of the chloride of iron and atmospheric air, with the result of producing sulphate of iron or sulphate of copper.—13 *C*, 1871, *June* 1, II., 714.

COLOROMETRIC DETERMINATION OF GOLD IN QUARTZ.

A process for the colorometric estimation of the quantity of gold in quartz has been submitted by Mr. Skey, of the government laboratory, to the Philosophical Society of Wellington, New Zealand, which is said to meet all requirements without the necessity of using quicksilver. The stone to be estimated, after having been thoroughly crushed and calcined, is immersed in a bath of iodine or bromine, and permitted to stand for some time. Slips of Swedish filtering-paper are then dipped in the fluid and dried alternately until the paper is thoroughly saturated, after which they are burned in a muffle. If no gold be present the ashes will be white, but one pennyweight to the ton will give them a beautiful purple color. It is believed that further experiments, with iodine or bromine baths, of known contents of gold, will enable the exact proportion of gold to be tested by the colorometric method.—8 *A*, *October* 1, 181.

NON-AMALGAMABLE GOLD.

The attention of Mr. Skey, of the Geological Survey of New Zealand, was called to a reported loss of gold during the process of extraction by mercury, and he found, on careful examination, that numerous samples of bright, clean-looking gold of two degrees of fineness refused to amalgamate on any part of their natural surfaces, and he ascertained by experiment that on such surfaces sulphur is always present. He also found that native pure gold will readily absorb sulphur from moist sulphuret of hydrogen or sulphide of ammonium, and that surfaces so treated refuse to amalgamate, although exhibiting no apparent change in their surfaces. He shows, however, that by roasting in an open fire, or by bringing it in contact with cyanide of potassium, chromic and nitric acid, and chloride of lime acidified, gold so affected is rendered amalgamable, unless copper be present to the extent of seven per cent., or perhaps less.—1 *A*, 1870, 282.

THIRD SILVER ALLOY.

An alloy, known as the Alliage tiers argent, or third silver alloy, has been assayed, and has been ascertained to be composed of copper, 59.06 parts; silver, 27.56; zinc, 9.57; nickel, 3.44, making a total of 99.63 parts. Its external color is precisely similar to that of pure silver, but on the fracture, which is finely granular, the color is light yellow, with a shade into reddish.—13 *C*, *August* 11, 1222.

TESTING SILVERY COATING OF METALS.

It is sometimes a matter of interest to be able to determine, by means of a simple test, the nature of a silvery coating to a metal, whether it be pure silver or some other substance. This is said to be readily accomplished by the use of a cold saturated solution of bichromate of potash in pure nitric acid, of one and two tenths specific gravity. The surface of the article to be tested is to be first washed with strong alcohol, so as to remove any lacquering, and then a drop of the solution applied by means of a glass rod, the place affected being immediately after rinsed off with water. If the substance in question be silver, a distinct blood-red spot of chromate of silver will be perceived. The spot is brown on German sil-

ver, and after rinsing shows no trace of red. With Britannia (composed of tin, antimony, and a little copper) a black spot will be developed, but no effect will be seen with platinum. Upon a surface amalgamated with mercury a reddish-brown deposit will be perceived, which is completely washed away on rinsing. With lead and bismuth a yellow deposit remains. Zinc becomes strongly etched, the liquid, however, disappearing completely on rinsing. Tin is attacked also very decidedly, but the test liquid imparts a brownish color, and an addition of water produces a yellow deposit which readily attaches itself to the metal.—8 *C*, 1870, 411.

EXTRACTION OF COPPER FROM REFUSE PYRITES.

The copper-mining industry of Cornwall is said, according to the *Athenæum*, to be suffering from a new form of competition. Iron pyrites, it is stated, is now imported in immense quantities from Sweden and Norway for the manufacture of sulphuric acid, and, after the sulphur is extracted, is operated upon for the two per cent. of copper which it contains. About 4000 tons of metal were obtained in 1869 from this source, while the entire yield from the native ores the same year was only about 8000 tons.—14 *C*, CC., 242.

PHOSPHORUS IN BRONZE.

An improved method of manufacturing bronze consists in introducing phosphorus in some form during the process of melting the copper, tin, or other metals which form the basis of the compounds, the effect being to very greatly improve the quality as regards elasticity, hardness, and toughness.—8 *A*, *January*, 1871, No. 6.

FLUID ALLOY OF SODIUM AND POTASSIUM.

It is stated that if 4 parts of sodium are mixed with 2½ of potassium, the alloy will have exactly the appearance and consistency of mercury, remaining liquid at the ordinary temperature of the air.—1 *A*, *August* 5, 72.

MALLEABLE BRONZE.

It is said that, in consequence of the announcements made some months ago before the Academy of Sciences of Paris in reference to the subject of malleable bronze, this substance is

now likely to come into practical use in European and American art. The existence of such a substance has long been known from specimens of very ancient origin, and from its use by the Chinese in the construction of their tom-toms. It may be prepared from bell-metal bronze, to which twenty per cent. of tin has been added, and heating to a dark red. This generally brittle metal thus becomes malleable, and can be readily forged and rolled out from a thickness of three or four millimetres to that of a half to a quarter of a millimetre. In the operation the density of the metal is increased, and it can be welded easily, preserving its entire homogeneity. The whole secret rests in giving the bronze the proper degree of heat, since without this it remains brittle.—8 *C*, XXVII., *July* 6, 214.

COATING FABRICS WITH METAL.

For the purpose of coating fabrics and tissues with metal, such as copper, silver, and gold, the material is first to be impregnated with a solution of sulphate of copper in ammonia, and then dried. After drying, the whole is immersed in a warm solution of grape sugar, which develops oxide of copper, upon which silver or gold can be electroplated in the usual way.—13 *C*, 1870, 367.

COATING ZINC WITH IRON.

According to C. Puscher, of Nuremberg, zinc utensils may be durably coated with iron in the following manner: Five ounces of pure sulphate of iron and three ounces of sal ammoniac are first dissolved in five pounds of boiling water, and the objects to be treated immediately immersed. After from one to two minutes, the loose black deposit is removed by brushing it off with water. The principal effect of this operation is a perfect cleaning of the surface. The immersion in the hot iron solution is then repeated, with the difference that the objects when taken out are heated, without rinsing, over a pan of live coals as long as the ammoniacal vapors are evolved. When, after several immersions, the coating is considered thick enough, it is polished by brushing, and will ever afterward be a perfect protection against oxidation. It imparts a fine black lustre to the coated surfaces.—14 *C* CC., 47.

ELECTROPLATING WITH NICKEL.

An important improvement in the electroplating of metallic objects with nickel has been patented by Mr. Adams, of Boston, and is now worked in several of our cities with much success, the result being to give to a great variety of articles, such as knives, forks, surgical and dental instruments, stair-rods, andirons, students' lamps, plumbers' materials, etc., a coating resembling polished steel, and quite as hard, and which is proof against ordinary oxidizing or other influences, retaining a high polish for a long period of time.

The special feature of Mr. Adams's invention, and that upon which the patent mainly rests, consists in the exclusion of the smallest quantity of potash, soda, or other alkaline earth from the bath containing the nickelizing preparation; pure double chloride of nickel and ammonium, or the perfectly pure sulphate of nickel and ammonia, and perfectly pure nickel being also required, as one of the electrodes, the nickel adhering regularly and strongly in consequence, and only needing polishing after the metal coated over is taken from the bath.

It seems, however, that this precaution, as indicated by Mr. Adams, is not necessary, and that the general process may be prosecuted by any one without infringement of the patent, as, according to M. Becquerel, potassa in no way affects injuriously the deposition of nickel, since the double sulphate of nickel and potassa can be applied as well as the double sulphate of nickel and ammonia; but if the positive electrode is not made of nickel, it is necessary to add free ammonia in order to saturate the sulphuric acid which is set free.—8 *A*, *October* 1, 185.

NICKEL AND COBALT PLATING IN THE WET WAY.

Professor Stolba, of the polytechnic laboratory of the Polytechnicon of Prague, a chemist who has been the first to announce to the world several important technical discoveries, especially in reference to the plating of metals, has just published, in Dingler's *Polytechnic Journal*, an article upon the method of coating metals of all kinds with nickel and cobalt in the wet way, or by boiling; and he thinks that it will be quite possible to imitate the effect of, and even to furnish a

satisfactory substitute for, the method by electroplating, which has lately come so generally into use.

The value of nickel plating is, of course, well understood, and it is now very much used wherever polished iron or brass is liable to corrode, as is particularly the case in the vicinity of salt water. In large yachts, where expense is no consideration, all the metal work, as also the machinery of sea-going steamers, is often treated in this way; a notable instance of which may be seen in the yacht Resolute, a splendid vessel lately built for Mr. A. S. Hatch, of New York.

The details of Professor Stolba's process are too complicated for our pages; but we may say, in general terms, that it depends upon the action of salts of nickel in the presence of chloride of zinc and of the metal to be coated. The substances required are: first, a suitable vessel for conducting the operation, which may be of porcelain or metal; second, a suitable salt of nickel, which may be either chloride, sulphate, or the sulphate of nickel and potassa; third, a solution of chloride of zinc; fourth, clippings of sheet zinc or zinc wire and powdered zinc; fifth, pure hydrochloric acid. Cobaltizing, as Professor Stolba terms it, is conducted in very much the same way—a salt of cobalt being used in place of the salt of nickel.—14 *C*, CCI., 145.

ELECTROPLATING METAL WITH NICKEL OR COBALT.

A process devised by Mr. Nagel, of Hamburg, for coating iron, steel, and other oxidizable metals with an electro deposit of nickel or cobalt consists in taking 400 parts, by weight, of pure sulphate of the protoxide of nickel by crystallization, and 200 parts, by weight, of pure ammonia, so as to form a double salt, which is then dissolved in 6000 parts of distilled water, and 1200 parts of ammoniacal solution, of the specific gravity of 0.909, added. The electro deposit is effected by an ordinary galvanic current, using a platinum positive pole, the solution being heated to about 100° Fahrenheit. The strength of the galvanic current is regulated according to the number of objects to be coated. For coating with cobalt, 138 parts, by weight, of pure sulphate of cobalt are combined with 69 parts of pure ammonia, to form a double salt, which is then dissolved in 1000 parts of distilled water, and 120 parts of ammoniacal solution, of the same spe-

cific gravity as before, are added. The process of deposition with cobalt is the same as with nickel. — 3 *A, August* 12, 112.

RAPID METHOD OF TINNING.

A valuable recipe for tinning copper, brass, and iron in the cold, and without complicated apparatus, has recently been published by Prof. Stolba, of Prague. A prerequisite is that the article to be tinned be perfectly free from oxide or grease of any kind, it being necessary that the surface be cleaned in the most careful manner, although it is immaterial whether this be done by mechanical or chemical means, so that the desired object be effected.

The substances used in the process are, first, powdered zinc, which may be the ordinary zinc dust, called sometimes zinc gray, but that which is prepared expressly for the purpose will be best. For this it is only necessary to melt some pure zinc, and pour it into a previously warmed iron mortar. As soon as it has become hardened it can be readily pulverized, and should then be freed from its coarser grains by sifting. The proper fineness is that of ordinary writing-sand.

The next ingredient is a five to ten per cent. solution of the salt of tin (simple chloride of tin), to which is to be added as much powdered cream of tartar as can be taken up on the point of a knife. Next is required a piece of sponge, or a pad of some kind. The process of tinning is extremely simple. The pad is first to be dipped in the solution of salt of tin, and applied to the object to be tinned, so as to moisten it thoroughly. A small quantity of the zinc powder having been spread out on a glass plate, a portion of this powder is then to be taken up by the pad, and quickly and firmly rubbed upon the article in hand. The tinning makes its appearance almost immediately, and, in order that the surface may be coated uniformly, it is only necessary to dip the pad alternately into the solution of tin (which is to be kept in a little dish) and into the zinc powder, and then to apply it. After the operation is completed, which, for small objects, requires only one or two minutes, the article is to be washed off in water, and then cleaned with Tripoli, or polishing powder. The effect of this application upon polished brass or copper is extremely beautiful, the surface resembling silver, and keep-

ing its lustre for a long time. The author of the process has applied it to great advantage in his laboratory for the purpose of coating articles of iron, steel, and copper, thereby protecting them against rust. One difficulty in the process results from the fact that only a very thin layer of tin can be applied. Should it become practicable to impart a thicker coating, it will probably acquire great importance. Experiments upon nickelizing metallic substances in a similar manner are in course of progress by the author, although thus far without satisfactory result.—14 *C*, CXCVIII., *December* 4, 308.

We learn that Professor Stolba's experiments have been repeated with much success. The tinning of cast-iron, wrought iron, steel, copper, and brass is found to be very satisfactory, the tin adhering very firmly, even when in very thin layers. Diluted sulphuric acid, however, it is said, generally produced dark spots and removed the coating. Experiments have been made to apply the same process for the ornamentation of metallic objects. These were tried especially upon cast-iron articles electroplated with copper, where the projecting edges were tinned, with excellent effect. As greasy spots can not be tinned, it is only necessary to apply very thin layers of oil to the places where no deposit is desired in order to coat the remainder of the article with tin, thus producing a striking contrast.—6 *C*, V., 49.

GALVANOPLASTIC COPIES FROM ORGANIC MATRICES.

The usual method of obtaining galvanoplastic plates from matrices of an organic nature consists in either coating the surface with graphite or a powdery deposit of silver, or else imparting conductivity by sulphide of silver. These methods are only suitable for rough work, since the delicate gelatine reliefs produced in the operation are decidedly affected by the sprinkling of the substances mentioned, which destroy the sharpness of the detail. It is, therefore, much better to produce a deposit of silver directly upon the gelatine in the sunlight, which, in consequence of the presence of an organic substance, will be in a state of purity, and attached uniformly and continuously upon the surface. For this purpose the gelatine relief sheet is to be fixed to a glass plate by means of copal varnish, and allowed to remain for an hour in a concentrated solution of tannin, in order to render it insoluble in

water. It is then immersed in a silver bath until the entire surface of the relief is moistened. A copper wire, bent at right angles, is now to be moved over the horizontal surface of the object so as to touch the surface when placed in the sunlight. The silver is then deposited in the form of little rays upon the copper wire, and becomes a lustrous continuous coating upon that portion of the object touched by the copper. The plate is next to be taken out as horizontally as possible from the solution, and laid in the sunlight to dry. The superfluous silver is then to be washed off with water, leaving behind a silvery layer, which is an excellent conductor of the galvanic current, so that a satisfactory result will be obtained with a small amount of electricity.—14 *C*, C., 315.

GILDING AND SILVERING SILK.

According to a formula published by Grüne for silvering or gilding silk, the silk is to be soaked with a five per cent. solution of iodide of potassium, and dried; then (in non-actinic light) dipped in a five per cent. solution of nitrate of silver, containing a few drops of nitric acid, and well drained; next exposed for a few minutes to sunlight, and then dipped in a two per cent. solution of sulphate of iron. It immediately becomes gray from reduction of metallic silver, and, after washing and drying, only requires burnishing in order to acquire the metallic lustre. By repeating this treatment, varied, however, by adding a little free iodine to the solution of iodide of potassium, the silver deposit becomes stronger. By laying the silvered silk in a very weak solution of chloride of gold the silver becomes chloride, and gold is deposited; and by then removing the chloride of silver by a solution of hyposulphite of soda, washing, drying, and burnishing, the appearance of gilding is produced, if the deposit of metal be sufficiently thick. The purest chemicals must be used in order to secure satisfactory results.—*Jour. Chem. Soc. Lond.*, 1871, *June*, 450.

MICROSCOPIC CHARACTER OF IRON AND STEEL.

According to Mr. Schott, the different qualities of iron and steel can readily be distinguished by means of the microscope. Thus the crystals of iron are double pyramids, in which the proportion of the axes to the bases varies with the

quality of the iron. The smallness of the crystals, and the height of the pyramids composing each element, are in proportion to the quality and density of the metal, which are seen also in the fineness of the surface. As the proportion of the carbon diminishes in the steel, the pyramids have so much the less height.

In pig-iron, and the lower qualities of hard steel, the crystals approach more closely the cubic form. Forged iron has its pyramids flattened and reduced to superposed parallel leaves, whose structure constitutes what is called the nerve of the steel. The best quality of steel has all its crystals disposed in parallel lines, each crystal filling in the interstices between the angles of those adjoining. These crystals have their axes in the direction of the percussion they undergo during the working. Practically, good steel, examined under the microscope, has the appearance of large groups of beautiful crystals, similar to the points of needles, all parallel and disposed in the same direction.—8 *A*, *September* 1, 168.

PURIFICATION OF IRON BY SODIUM.

A method recently suggested for freeing iron from its deleterious impurities consists in first forming an alloy of the iron with one of the alkaline metals, either sodium or potassium, which is done by forcing the vapor of either into a mass of molten iron. To do this with the pure metal would, of course, be inexpedient, on account of the expense; but the same result may, it is said, be obtained by saturating the coal or coke used to reduce the iron with a solution of carbonate of soda, and drying it before it goes into the furnace, or by adding common salt to the fluxing materials. Sodium will, it is asserted, enter into combination with the iron in either case. This, perhaps, is somewhat questionable. The alloy, when prepared, is to be melted, and a current of moist air, or moist carbonic oxide, sent through it. Decomposition ensues, and the alkaline metal combines readily with any metalloid, such as silicon, sulphur, or phosphorus, removing them from their mixture, and leaving a pure iron under some circumstances, and pure steel under others.—8 *A*, *July*, 129.

HEATON STEEL.

A French investigator, in the course of certain experiments upon steel prepared by the Heaton process—which, it appears, contains a rather larger proportion of phosphorus than the Bessemer steel—concludes that phosphorus, in a quantity of from two to four thousandths in steel, causes the metal to be rigid, and, while tending to increase the elasticity and resistance to breaking, does not modify the hardness. Such steel, however, he thinks, is wanting in real strength and toughness, being brittle, and not sustaining sudden shocks. His general conclusion is that even very small quantities of phosphorus, when present in steel, not only do not improve it, as has been asserted, but actually deteriorate it. The best method of estimating the percentage of phosphorns in steel is said to be the examination of the spectrum produced by the combustion of hydrogen obtained by the action of chlorohydric acid upon the metal.—1 *A*, *March* 25, 142.

PREPARATION OF BAR-IRON FROM PHOSPHURETED CAST-IRON.

In view of the great eminence of the Mining Academy at Freiburg as a school for instruction in practical metallurgy and mining, it may be of interest to know that one of its professors, T. Scheerer, has lately announced that he has discovered a method by which an excellent bar-iron may be prepared from cast-iron containing any amount of phosphorus. The expense of the process (which is not at all complicated nor very peculiar) is said to be trifling, and the discovery must be considered of the utmost value to workers in iron. Although it has been patented in various countries, the discoverer is quite willing to place it at the service of iron-masters throughout the world at a very moderate rate. Without as yet announcing his terms, he invites all persons interested to visit the establishment in Germany, where iron is at present being manufactured according to the new method.—14 *C*, CC., 242.

BERARD PROCESS FOR MAKING STEEL.

Many methods have been indicated of late years for manufacturing steel direct from pig-iron, that of Bessemer being well known, and worked in a great many establishments in

Europe and America. According to the *Mechanics' Magazine*, a rival to this method is to be found in the system of Berard, as adopted at the steel-works in Givors, in France. The principal features of this are, first, the employment of gas, acting at once as a heating and reacting agent in improving the quality of the iron by a partial purification, before throwing off such injurious bodies as sulphur, phosphorus, arsenic, etc.; second, the ability to employ iron of a secondary quality to obtain steel for certain special purposes, as rails, tires, etc.; third, by the combined action of air and gas, in being able to act alternately by means of oxidation and reduction in keeping the waste at a minimum, and by decarbonizing and recarbonizing, to regulate at will, and with certainty, the nature of the product to be obtained.

The details of the method are too technical to be given here, although the results are recommended by their excellence and the economy in cost in obtaining them. The operation requires from an hour to an hour and a half, and the process is so conducted that the manipulation can be arrested at any moment, and any desired quality of steel obtained.—3 *A*, 1871, *April* 7, 233.

THEORY OF BESSEMER AND HEATON STEEL PROCESSES.

In the course of certain remarks respecting the production of artificial charcoal iron, Mr. Berthault observes that both Bessemer and Heaton base their systems upon the purification of the pigs by oxidizing reaction, either of nitrate of soda or of nitrate of potash; but, referring to the quantities of alkaline salts contained in various fuels, Mr. Berthault remarks that the results appear to prove that soda or potash salts, thrown into the blast-furnace at the same time as the ore and fuel, would give with coke or other mineral fuel a metal closely resembling charcoal iron, and even a steely pig. Every thing will depend upon the quantity of soda or of potash added, and he contends that the best salt to employ is the neutral carbonate of potash, such as is obtained from vegetable sources, and commonly known as pearlash. To obtain iron of uniform quality in the blast-furnace, it is desirable to mix the salt with some glutinous liquids, such as blood and water, and dampen the coke with it.—8 *A*, *April* 1, 65.

GRAPHITE IN GRAY OXIDE OF IRON.

From recent investigations of Sneller, we are informed that the graphite segregated in gray oxide of iron consists of pure carbon, but that there is no free graphite-like silicon associated with it, although some occurs in combination. The quantity of carbon which remains enveloped in the hardening of a fluid cast-iron appears to be dependent on the proportion in which the carbon was dissolved in the liquid iron, and upon the rapidity with which the transformation took place from the liquid to the solid state, rather than upon the quantity of foreign elements, such as manganese, sulphur, phosphorus, silicon, etc., thus not upon the height of the temperature at which the iron was treated. While in puddling, nearly all the silicon is burned before the carbon becomes oxidized, this process of oxidation in the Bessemer method comes on about equally with the two elements, if not even more rapidly with the silicon. The remarkable fact that the same amount of silica which makes the Bessemer and cast steel cold-short does not affect the quality of wrought iron under all conditions appears to depend upon the circumstance that steel contains the silica in a state of chemical combination, while in wrought iron it only occurs as a slag.—18 *C*, XI., *August* 2, 493.

FORMATION OF PLUMBAGO.

The presence of plumbago in gneiss, mica slate, clay slate, granular limestone, etc., according to Dr. R. Wagner, is dependent upon the chemical reaction of the decomposition of cyanogen and its combinations. This is illustrated, and in a measure proved, in Dr. Wagner's opinion, by the formation of graphite, as has been seen to take place in Le Blanc's soda manufactory. At a certain stage of the transformation of the soda into caustic soda cyanogen undergoes a decomposition, and graphite, or plumbago, is developed in abundance upon the surface of the lye. The amount produced is so great as to have suggested a source for graphite in the manufacture of lead-pencils, should the mines of the natural material ever fail. Quite large masses of this graphite are obtained as a secondary product of the soda-works in a chemical establishment at Aussig, in Bohemia.—14 *C*, CXCVIII., 176.

DETERMINATION OF CARBON IN STEEL.

Mr. Hermann considers that the usual method of determining carbon in steel by the colometric process of Eggertz is not reliable, especially when the amount of carbon is large and needs to be ascertained with accuracy, but comes to the conclusion that the direct burning of iron in a stream of oxygen is the most expeditious and accurate method.—15 *A*, *June* 24, 841.

ACETATE OF ZINC A PRECIPITATE FOR HÆMIN.

Gunning has discovered in acetate of zinc a reagent that precipitates the slightest traces of the coloring matter of blood from solutions, even where the liquids are so dilute as to be colorless. Blood washed from the hands in a pail of water can readily be detected in this way. The flocculent precipitate thrown down by acetate of zinc must be washed by decantation, and finally collected on a watch-glass and allowed to dry, when the microscope will readily reveal hæmin crystals if any blood be present.—16 *A*, *July*, 1871, 401.

HYDROGEN GAS.

A new process, it is stated, has recently been discovered for obtaining hydrogen gas in large quantities. Alkaline earths are heated with coke or charcoal to a red heat, when carbonic acid hydrogen are freely eliminated. The carbonic acid is absorbed by water, and the pure hydrogen is collected in a separate reservoir.

ABSORPTION OF GAS BY IRON.

According to M. Jacobi, of St. Petersburg, iron obtained by galvanic deposit possesses the peculiarity of being so hard as to scratch glass and to be very brittle; but when heated, its color becomes deeper, its hardness and brittleness are lost, and its specific gravity considerably increased. This fact led the experimenter to believe that the iron, as at first deposited, might contain gas in its substance, and on heating a small quantity carefully nearly eighteen volumes of gas, chiefly hydrogen, were driven off and collected.—5 *A*, 1870, 101.

ABSORPTION OF GAS BY CHARCOAL UNDER INCREASED PRESSURE.

Mr. Hunter, of London, has lately shown that the quantity of gas absorbed by charcoal increases with the amount of pressure to which it is exposed, and that equal variation in pressure produces nearly equal variation in the quantity of the absorbed gas.—16 *C*, 1871, 118.

ABSORBENT POWERS OF CHARCOAL.

Dr. Hermann Vohl, of Cologne, has lately published an elaborate paper in the *Archiv der Pharmacie* upon the absorbent power of charcoal and its application for disinfectant and deodorizing purposes, replete with suggestions of great importance.

Among other deductions from his experiments, he states that the carbonic acid gas obtained by heating charcoal is not derived from the coal itself, but has been absorbed from the atmosphere, and is held with such tenacity that it can not be driven out by boiling in water, but that a temperature much below that of ignition is sufficient to expel it. This conclusion is the same as that which had been reached by another experimenter, to which we have previously made reference. Among other facts proving this statement, Dr. Vohl remarks that when charcoal has been once freed from its carbonic acid and saturated with pure oxygen, no trace of carbonic acid is appreciable, even when heated to a temperature of 680° Fahrenheit.—2 *C*, *June* 8, 177.

ALKALINITY OF CARBONATE OF LIME.

According to Mr. Skey, of the Geological Survey of New Zealand, carbonate of lime is alkaline rather than neutral, as shown by the fact that when prepared by igniting pure oxalate of lime in a close crucible, at a dull red heat, it gives an intense alkaline reaction with reddened litmus paper, after moistening with water, or after reignition with pure carbonate of ammonia; carbonate of lime, prepared directly from chloride of calcium and bicarbonate of soda, giving the same reaction with test-paper. Other experiments are specified, all tending to substantiate the same general proposition.—5 *A*, *October*, 1870, 423.

MANGANESE IN BLOOD AND MILK.

According to Professor Pollatti, human blood contains manganese as one of its essential elements; and, concluding that the same metal would be found in milk, he examined various specimens of human milk, as also that of cows, goats, and other animals, and in every case he found unmistakable evidence of the presence of this metal, the quantity in milk appearing to be greater than that in an equal quantity of blood.—13 *A*, *June* 11, 237.

AQUEOUS SOLVENT FOR SULPHUR.

Various experiments have been made for the purpose of finding an aqueous solvent for sulphur, this being considered a very great desideratum in facilitating the use of this substance as a medicine. Dr. Pole announces that if flowers of sulphur, previously well washed and dried at 212° Fahrenheit, are mixed with an aqueous solution of pure anhydrous carbonate of soda, and the whole digested together at a temperature of 212° for ten hours, an appreciable quantity of sulphur will be taken up. Linseed oil is another solvent for sulphur, the amount increasing with the increase of temperature.—1 *A*, *October* 28, 214.

SOLIDIFICATION OF MELTED ROSIN.

Mr. Vincent, in remarking upon the readiness with which broken ice resolidifies at temperatures above the freezing point, calls attention to the same general principle seen in other cases. Among these he cites rosin, which, when freed from turpentine, and subjected to pressure in a melted condition, or otherwise, at ordinary temperatures, becomes completely pulverized, its particles showing no cohesive power whatever. If, however, the temperature of the rosin be raised considerably above the melting point, on pressure being applied, a different result ensues, the mass becoming at once solid at the core, the outside alone showing signs of liquefaction. When rosin is melted for manufacturing purposes, and the workmen neglect to stir it for even a few minutes, the whole mass becomes completely solidified, and liquefaction takes place only at the exterior. From this and other instances stated by Mr. Vincent, he comes to the conclusion

that the disintegration produced by liquefaction of one portion of the bodies referred to causes them to exert a greater power of aggregation in the parts less exposed to heat.—1 *A*, *December* 30, 313.

GUN-COTTON IN BISULPHIDE OF CARBON.

According to Dr. Bleekrode, if gun-cotton be first wet with bisulphide of carbon (a highly inflammable liquid), and an electric spark be passed through it, instead of producing an explosion of the cotton, the bisulphide alone is set fire to, the gun-cotton apparently remaining intact among the burning bisulphide, presenting almost the aspect of a mass of snow slowly melting away. The experiment may be varied by using either benzine or alcohol instead of the bisulphide, and igniting it afterward with any flame. All these liquids yield the same result, and there is no danger in the experiment, even if large quantities are used. This curious phenomenon is explained by Dr. Abel, who says that "these results indicate that if, even for the briefest space of time, the gases resulting from the first action of heat on gun-cotton upon its ignition in open air are impeded from completely enveloping the burning extremity of the gun-cotton twist, their ignition is prevented; and as it is the comparatively high temperature produced by their combustion which effects the rapid and more complete combustion of the gun-cotton, the momentary extinction of the gases, and the continuous abstraction of heat by them as they escape from the point of combustion, render it impossible for the gun-cotton to continue to burn otherwise than in the slow and imperfect manner, undergoing a transformation similar in character to destructive distillation."

As a practical application of these facts, it is suggested that if gun-cotton be kept in a flask in a layer of benzine or bisulphide of carbon, the danger of explosion in case of a fire is obviated, since, if the liquid is ignited by any means, the gun-cotton will burn slowly and gradually. When required for use, a brief exposure to the air restores its explosive qualities. —*London, Edinburg, and Dublin Philosophical Magazine, January*, 1871, 40.

CHROME ALUM.

Much has been said, of late, of a substance known as chrome alum, which has been used in the Albert and Edward process of electrotype printing, for the purpose of hardening the gelatine film and rendering it insoluble in water. Inquiries have been pressed in various quarters for the recipe for preparing this substance, and we find in the *Mechanics' Magazine* a reply, in which it is stated that if three ounces of bichromate of potash be dissolved in as little boiling water as possible, and then four ounces of strong sulphuric acid be added, and afterward alcohol, drop by drop, be introduced, a pure green tint will be developed. The liquid should be stirred frequently during this process, and then boiled down to a small volume and set aside. After a few days violet crystals separate, which, when washed with pure water, are said to be sufficiently pure for ordinary purposes.—18 *A*, *May* 12, 190.

IMPROVED TEST-PAPER.

A new test-paper of extreme sensitiveness can be prepared, it is said, from the leaves of the ornamental plant known as the *Coleus verschaffelti*. The fresh leaves of the plant are to be steeped for twenty-four hours in absolute alcohol, to which some drops of sulphuric acid have been added, and the liquid afterward filtered. Into this are to be dipped strips of Swedish filtering-paper, which are then allowed to dry in the air. A test-paper of a beautiful red color will thus be obtained, which will pass more or less into a fine shade of green by the action of alkalies or alkaline earths. This paper will keep for a long time if preserved in well-closed jars, and will be found much more sensitive than the ordinary tests. It is not affected by carbonic acids, but indicates the least trace of the carbonates or alkaline earths that may be dissolved in water. If a band of this paper, slightly moistened, be exposed to an open gas jet, it will change rapidly to green, in consequence of the ammonia contained in the gas.—2 *B*, *May* 14, 539.

ACTION OF WATER-GLASS.

In a communication by Flückiger upon certain reactions of water-glass, some important technical applications are sug-

gested as the result of the chemical relationship dwelt upon. Thus many of the practical applications of this substanee depend especially upon the separation of silicic aeid, and are more efficient in proportion to the amount and eompleteness of this separation. If, therefore, surfaces whieh are to be silicified are eoated alternately with water-glass and a solution of eommon salt, they will ultimately be found to possess a harder and more uniform exterior. By first saturating stone or wood with a solution of sal ammoniac, or eommon salt, and adding the water-glass before the former applieation is eompletely dry, the result will be found to be very satisfactory.—2 *C*, *Nov.*, 1870, 105.

IODINE FROM CHILE SALTPETRE.

Iodine is said to be now manufactured on a large scale from Chile saltpetre (nitrate of soda), over thirty thousand pounds per annum being obtained. The proeess eonsists in treating the liquids resulting from the manufaeture of saltpetre with a mixture of sulphurous acid and sulphite of soda, in proper proportion, when the iodine falls to the bottom as a black precipitate. This is allowed to drain on layers of quartz sand, and is then removed, and finally purified by sublimation.—*Panama Star and Herald*, *Jan.* 17.

RESTORING SPENT SULPHURIC ACID.

A patent has lately been taken out in England for restoring spent sulphuric acid, and the inventor of the proeess claims that by its means he ean revivify the acid so cheaply that the same weight can be obtained for one cent that now costs seven in new acid. The method consists essentially in heating the spent aeid in a vessel of peculiar eonstruction with dry steam to a temperature of about 120°, after which six or seven pounds of blaek oxide of manganese are to be sprinkled into it, and more steam is turned on. The tank is then covered, and eare must be taken to prevent its foaming over; should any thing of this kind be threatened, the steam must be turned off for a short time, and the foam will subside. The heating is kept up six or eight hours, and then the liquid allowed to cool, after which any oil or tar that has come to the surface is to be skimmed off, leaving the restored aeid behind.—8 *A*, *Jan.*, 1871, 12.

CERIUM A TEST FOR STRYCHNINE.

The oxide of cerium is recommended as a valuable test of strychnine, since when concentrated sulphuric acid is poured over strychnine, and oxide of cerium added to the mixture, a beautiful blue color makes its appearance, a similar result also taking place when the bichromate of potash is used instead of cerium. The combination first mentioned, however, with the same intensity of color, is much more durable, so that when the chrome reaction has long since disappeared, that produced by the cerium is persistent and easily recognized. The blue tint passes gradually into a cherry-red, and then remains unaltered for several days. It is stated that the one hundred thousandth of a grain of strychnine can be readily recognized by this test. Other vegetable alkaloids give a totally different reaction with cerium, and can not, therefore, be confounded with the strychnine.—15 *C*, XVI., 256.

TESTING THE PURITY OF HYDRATE OF CHLORAL.

The purity of hydrate of chloral may, it is said, be tested by means of a concentrated solution of potash. The pure hydrate does not color this at all, or at most only a feeble yellow, and gives forth the pure smell of chloroform. Should the liquid assume a brown color, and the smell of chloro-acetic acid be combined with that of chloroform, or should gases of a pungent odor be developed, which is not seldom the case, the product is impure and unfit for use.—15 *C*, 1870, 94.

TEST FOR BENZOLE.

For distinguishing genuine benzole, or that made of coal tar, from that prepared from petroleum, Brandberg recommends us to place a small piece of pitch in a testing tube, and pour over it some of the substance to be examined. The genuine will immediately dissolve the pitch to a tar-like mass, while that derived from petroleum will scarcely be colored.—12 *C*, v., *May*, 1871, 39.

DETECTION OF BUTYRIC ACID IN GLYCERINE.

The presence of butyric acid in glycerine may be detected, according to M. Perutz, by mixing the concentrated glycerine

with strong alcohol and sulphuric acid of sixty degrees. If the acid in question be present, butyric ether will be immediately formed and readily recognized by its smell, which strongly resembles that of the pine-apple.—2 *B*, *Jan.* 22, 1870, 95

SYNTHESIS OF CONIIN.

Dr. Schiff is said to have accomplished the first synthesis of a vegetable alkaloid, namely, coniin. The process by which this is effected is too technical for our pages, but the result obtained is stated to be entirely similar in its reaction and physical peculiarities to the natural alkaloid, and to possess like poisonous qualities.—1 *C*, 1871, IV., 64.

POTASSIUM IN TOBACCO-SMOKE.

A spectroscope analysis has, it is said, revealed the presence of potassium in tobacco-smoke; and as small quantities of potash increase the nervous excitability, while larger quantities diminish it, it is suggested that the percentage of this substance in tobacco-smoke may produce, at least in part, the peculiar sensations which are experienced in the cavity of the mouth after long and extreme smoking.—1 *C*, 1871, IV., 64.

RESEARCHES UPON TOBACCO-SMOKE.

Some recent investigations by Doctors Vohl and Eulenberg upon tobacco-smoke are likely materially to modify existing views in regard to the physiological action of the weed. Their paper is divided into three parts, the first of which treats of the chemical composition of commercial tobacco for smoking, for chewing, and snuff; the second contains the results of an examination of the products generated by the combustion of tobacco during smoking; and the third describes the physiological effects of the bases extracted from tobacco-smoke.

Commercial tobacco for smoking purposes was invariably found to contain nicotine, amounting sometimes to four per cent. or more, while in tobacco used for chewing and snuff only minute traces of that alkaloid could be detected, so that nicotine poisoning from chewing or snuffing would appear to be very problematical. The authors state that, as a fact, no such cases are on record.

Among the gaseous products given off during the smoking of good tobacco and cigars, there were found oxygen, nitrogen, marsh gas, and carbonic oxide, besides the more readily condensible gases and vapors—sulphureted hydrogen and hydrocyanic acid, and occasionally sulphocyanic acid, this case being produced at a later stage by the action of sulphureted hydrogen on hydrocyanic acid. The acid and non-basic products formed are formic, acetic, metacetic, butyric, valeric, and carbolic acids, creosote, perhaps cyprylic and succinic acids also, the latter from fermentation of the malic acid well known to exist in the green tobacco plant. There are also a solid hydrocarbon and a liquid hydrocarbon of the benzole series.

The most interesting fact in the inquiry was that no nicotine could be detected among the basic products of the distillation, proving that the injurious effects of tobacco-smoking are not to be attributed to this substance; on the contrary, it was in the alkaloids of the pyridin or picolin series, well known to be produced during the destructive distillation of wood and other vegetable products, that the poisonous influences were found. These were tested upon pigeons and Guinea-pigs, and were found to produce tetanic spasms, irregular action of the heart, and death. The same bases, obtained from other sources than tobacco, produced similar effects. As the same pyridin bases are among the products of the distillation of opium, the authors are inclined to attribute the effects produced by smoking this drug, not to morphia, but to the picolin series of alkaloids.—20 *A*, *September* 2, 285.

REGIANINE.

According to Dr. Phipson, the English walnut (*Juglans regia*), and probably the American species also, contain, among other substances, one which he calls *regianine* (obtained by treating the green husk of the fruit with benzole), which appears in the form of a yellowish substance crystallizing in groups of feather-like crystals. These are easily decomposed, and, when treated with alkalies or ammonia, yield a splendid and durable red solution, which, by a subsequent treatment, becomes the jet-black, amorphous, pure regianic acid.—2 *A*, *September* 8, 119.

A NEW CINCHONA ALKALOID.

A new alkaloid has, it is said, been detected in the mother liquor obtained in the manufacture of sulphate of quinine, distinguishable from the cinchona alkaloids by the solubility of its salts, which renders it very difficult of separation from the uncrystallizable quinoidin. It has not yet been determined whether it is contained in all the species of cinchona, or, if not, in which of them; nor have its physiological properties been experimented upon.—16 *A*, *July*, 1871, 405.

REMOVAL OF ODOR FROM TANNIN.

It is said that the peculiar odor of commercial tannin may be entirely removed, and thus better fitted for officinal administration, by first dissolving six parts in twelve parts of warm water, placed in a porcelain vessel, then pouring the solution into a flask after adding from one half to one part of ether, and shaking it up thoroughly. The mixture at first appears of a dirty green and very turbid, but settles in a few hours, the coloring matter sinking to the bottom in the form of a flocculent coagulum. The liquor is then to be filtered, and the filtrate evaporated. Tannin thus prepared has no odor, and gives a perfectly clear solution with water.—*Ding. Poly. Journ.*, CXCVII., I.; 98.

COMBUSTION OF SMOKE.

It is generally understood that the cause of smoke, in the case of burning wood and other forms of carbon, is due essentially to an insufficient supply of air, which prevents the combustion from being complete. This may seem strange when we are assured that the gases produced by combustion, of coal especially, contain an excess of air. This apparent inconsistency, however, is explained when we are informed that by a deficiency of air is simply meant that this is the case in each volume or stratum of air in which combustion has taken place; but the gases which pass into the chimney may be regarded as a collection of such volumes or strata mixed with others rich in oxygen, and these, in most instances, being too little heated to admit of their entering into combination.

From these theoretical considerations, it follows that, for

the purpose of avoiding or diminishing smoke, it will be sufficient to cause an intimate admixture of the gases the moment they quit the fire, even without introducing a fresh volume of air. This principle has been applied in several forms. In one, two fireplaces are built side by side, running parallel, and separated by a wall. The fires in these two fireplaces are fed alternately, and, the currents of gas being directed one against the other at the back of the furnaces, the strata are thus broken up and mixed, so as greatly to diminish the amount of smoke. Another application for the same purpose consists in introducing a little air, in a finely divided state, behind the bridge of the furnace. This air supplies the requisite oxygen at the moment when the combustible gases are still sufficiently heated for them to become ignited; and the admixture is readily effected, but with some loss of combustible matter. Still a third process, that of Thierry, consists in introducing a jet of steam over the surface of the fire. The steam does not exert any chemical action, but operates mechanically by mixing gases, and thus diminishing the amount of smoke. By means of these, and other applications that will readily suggest themselves, much may be done not only in preventing the escape of smoke from furnaces, locomotives, and hearths, but also in economizing the fuel by securing an appreciably greater intensity and amount of heat.—14 *A*, 1870, *July* 9, 22.

HYGRAFFINITY.

In a paper on the "Estimation of Antimony," published in the *Chemical News*, Hugo Tamm calls the attention of chemists to a new phenomenon, which the author describes under the name of "hygraffinity." This phenomenon was discovered in a peculiar compound of antimony—bigallate of antimony—which is totally insoluble in water, and yet possesses a powerful affinity for moisture, which it absorbs rapidly from the air, after being dried at the temperature of 212° F. Most powders and precipitates, dried at that temperature, as is well known, absorb moisture on exposure to the atmosphere, but this is a purely physical phenomenon, due to porosity. On the contrary, in the case of gallate of antimony, chemical affinity is at work, and this precipitate, after exposure to the air for two or three hours, actually absorbs two

equivalents of water. In a word, this insoluble substance has as much affinity for moisture as deliquescent salts. But one of the most curious features in connection with this extraordinary phenomenon is that, on being dried at 212° F., bigallate of antimony loses the two equivalents of water which it had absorbed from the air, and that, on being left exposed once more to the atmosphere, it reabsorbs the same amount of moisture. This interesting experiment may be repeated indefinitely.—15 *A*, *November* 11, 1871, 628.

ACRIDINE, A NEW ANTHRACENE DERIVATIVE.

A basic substance has lately been separated by Graebe and Caro from crude anthracene, to which, on account of its irritating action upon the skin and mucous membranes, they have given the name of acridine. This body is obtained by heating the semi-solid portion of coal naphtha, which boils between 300° and 360°, with dilute sulphuric acid, and precipitating the acid solution with potassium dichromate. A dirty brown precipitate is obtained, which dissolves on repeated treatment with boiling water. The solution thus obtained yields, after filtration and cooling, orange-yellow crystals of the chromate of the base; these crystals, freed from the mother-liquor by washing, yield the free base when warmed with ammonia. Thus obtained, the body is not quite pure; but it may be rendered so by recrystallizing its hydrochloride. Acridine substance crystallizes, as determined by Dr. P. Groth, in small, four-sided, rectangular prisms of the rhombic system, whose edges are often, but narrowly, truncated by the vertical prism, while the ends are formed by obtuse domes.

Acridine melts at 107°, and distills without alteration at a temperature above 360°. It sublimes, even below its melting-point, in large, broad needles. It is almost insoluble in cold, and but little soluble in boiling water. On the other hand, it dissolves readily in alcohol, ether, carbon-bisulphide, and hydro-carbons. The dilute solutions show a beautiful blue color by reflected light. It exerts a slight but distinct alkaline reaction on litmus. When inhaled, either in dust or vapor, it causes sneezing, and, in large quantity, coughing. It is exceedingly stable, and may be distilled unaltered over either ignited zinc or soda-lime, although most readily at-

tacked by sodium amalgam. Two series of salts of acridine have already been prepared by the authors, and numerous compounds with other substances examined by them.—21 *A*, *August*, 1871, 708.

ACTION OF LIGHT ON PETROLEUM.

According to recent investigations, when petroleum oils are exposed under certain conditions to the sunlight, they absorb from the air oxygen, which is converted into ozone. No chemical combination takes place between the oil and the ozone, but the latter remains free, and oxydizes any substance with which it comes in contact. In oils containing ozone the smell is materially modified; they burn with difficulty, and attack rapidly the stoppers of the vessels containing them, especially if the stoppers be composed of cork. When glass vessels are used it has been found that the color of the glass exercises a great influence over the absorption of oxygen. Decolorized oils exposed in white glass vessels to the action of sunlight turn yellow, become charged strongly with ozone, and burn with difficulty. This is principally the case with the American petroleums. They should, therefore, be kept in metallic vessels, or, if glass be used, it should be shaded as much as possible from the sun.—13 *C*, *August* 11, 1870, 1151.

BRITTLE SILVER.

Attention has lately been directed to the change which alloys of silver experience by long burial in the earth, and several articles have appeared in scientific journals on the subject; one based upon the examination of ancient Roman vases found buried in the Black Forest of Germany; and another, by Professor Church, in reference to the specimens lately exhumed in the island of Cyprus by Mr. Di Cessnola, the resident American consul. These latter were found upon the site of the ancient city of Idalium, and lay claim to an antiquity of at least 1500 years, during which time they have become covered externally, to the depth of about one thirtieth of an inch, with a crust, which proved, upon analysis, to be composed principally of finely divided silver, mixed with the chloride and sulphide of that metal, and a little basic carbonate of copper. Beneath this layer the substance of the metal appears white, metallic, and uniform, but very brittle,

the objects being readily snapped by a very slight pressure. It was found, however, that by gentle hammering, or rolling, the brittle mass could be easily restored to its original malleable condition, while its density gradually rose from 9.06 to 10.2. From this it would appear that the change is molecular, and not chemical, the extreme portions alone being modified.—21 *A*, *July*, 1871, 498.

DAMBOSE, AN INGREDIENT OF BORNEO CAOUTCHOUC.

M. A. Girard, in a late communication to the Academy of Sciences of Paris, presents a notice of a new volatile and saccharine principle discovered some time ago by him in the caoutchouc of Borneo, and which is remarkable for its decomposition in the presence of hydriodic acid. This, when heated in a closed vessel to a certain temperature with an excess of the acid, separated into a methyl-hydriodic ether, and a new substance, likewise saccharine, crystalline, and of great stability, having the composition of dried glucose, and having much analogy with inosite. This substance he names *dambose.*—3 *B*, XVII., *August* 24, 1871, 337.

CHARACTERS OF PURE GLYCERINE.

According to Köller, among the characteristics of pure glycerine, as compared with an impure article, are the following: Pure glycerine has a neutral reaction, and on evaporation in a porcelain dish leaves only a very slight carbonaceous crust, while the impure has a much greater percentage of coaly matter. The pure article does not become brown when treated, drop by drop, with concentrated sulphuric acid, even after several hours; the impure becomes brown even when but slightly adulterated. Pure glycerine, treated with pure nitric acid and a solution of nitrate of silver, does not become cloudy, while the impure exhibits a decidedly milky appearance. Sometimes the impure article becomes blackened with the sulphide of ammonium. Oxalate of ammonia produces a black clouding; lime-water sometimes causes a milky discoloration. Pure glycerine, however, constantly remains perfectly uncolored, and clear as water, the impure becoming colored to a greater or less extent. If a few drops are rubbed between the fingers, pure glycerine causes no fatty smell; the contrary is the case with the impure, especially

if a few drops of dilute sulphuric acid be introduced.—18 *A*, *October* 4, 1871, 631.

ARTIFICIAL PREPARATION OF MILK.

One of the latest enterprises in organic chemistry consists in the preparation of artificial milk, which has been attempted by Dubrunfaut, and which he claims to have accomplished by emulsifying fatty matters with an artificial serum. This is done as follows: 40 or 50 grams of saccharine matter (lactin, cane-sugar, or glucose), 20 or 30 grains of dried albumen (the dried white of egg, as met with in Paris), and 1 or 2 grams of crystals of soda carbonate, are dissolved in a half litre of water, and the whole is emulsified with 50 or 60 grams of olive-oil, or other comestible fatty matter. The emulsification takes place best at a moderate temperature, that of 50° or 60° being sufficient. The liquid thus prepared has the appearance of cream, and requires to be mixed with twice its volume of water to acquire the consistence and aspect of milk. To prepare a fluid approaching cream in its qualities, gelatin is substituted for albumen; 100 grams of fat are emulsified in a litre of serum, containing 2 or 3 grams of gelatin. Artificial cream prepared in this way shows no tendency to separate into fat or serum.

Gaudin, in discussing the preceding suggestion, gives his testimony as to the depriving fats of all unpleasant odor by mere subjection to an appropriate temperature. He also states that very good artificial milk can be prepared from bones rich in fat, by purifying this fat by means of superheated steam, and combining the fat thus obtained with gelatin. This milk is, he says, almost like that of the cow; and, when kept, acquires first the odor of sour milk, then that of cheese. The gelatin in it represents the caseine; the fat, the butter; the sugar, the sugar of milk. It serves for the preparation of coffee and chocolate, of soups and creams of excellent flavor, and its cost is but trifling.

E. MINERALOGY AND GEOLOGY.

HOMERIC IRON.

It has been suggested that wherever iron is mentioned as occurring in the earlier Scriptures, as well as in the ancient Greek authors, such as Homer and Hesiod, in all cases it is to be considered as referring to meteoric iron, the period when mankind was able to reduce the metal from its ores not yet having arrived. This view is supported by Professor Haidinger, of Vienna, in a very elaborate and learned disquisition; and he also suggests that the iron found on the surface of the earth in Southern Africa for a time, and used by the natives, as well as that employed by the Esquimaux in making implements before their association with the whites, is due to the same origin.—*Mitth. Anthrop. Soc. Uren*, 63.

IRON IN GUAYAQUIL.

Accounts from Guayaquil report the discovery of iron in great abundance on the banks of the River Doull, occurring in the form of masses weighing hundreds of pounds of an hydrated peroxide of iron in crystals of micaceous iron, and a red hematite. As the surrounding forests will produce wood enough for making the necessary charcoal, it is proposed to start an iron furnace on the spot.—*Pan. S. and H., Jan.* 17.

XANTHOPHYLLITE A MATRIX OF DIAMOND.

Much inquiry has been prosecuted as to the matrix of the diamond, and various suggestions have been pronounced in regard to it, itacolumite, or the so-called flexible sandstone occurring in Brazil, the United States, and elsewhere being assigned this honor by many authors. From a communication by Professor Leonhard we are informed that the xanthophyllite of the Ural Mountains shares with the itacolumite in this respect, since in certain localities where this substance abounds a microscopic examination of its laminæ reveals to a magnifying power of thirty times the existence of large numbers of minute crystals of the diamond, while with a power of two hundred their crystalline form and relative position

can be distinctly traced. Most of these crystals are colorless and completely transparent; a few of them are brown. The mineral xanthophyllite above referred to is a micaceous substance occurring with magnetic iron in talcose slates.—3 *C*, *June* 26, 621.

GEOLOGY OF SOUTH AFRICAN DIAMOND-FIELDS.

Professor Morris, in a communication to the Geological Society of London upon the geology of South Africa, referred to the fact that the diamonds of South Africa came from certain stratified beds containing, besides reptilian remains (such as the *Dicynodon*), numerous plants and much fossil wood. He then suggested a query as to whether the diamonds themselves may not be of vegetable origin, and similar in character to the small crystal quartz found in the stems of bamboo. —13 *A*, *December*, 1870, 70.

GEOLOGY OF MISSOURI.

The first annual report of the State Geologist of Missouri, under the new organization, has just been made to the Legislature by Professor A. D. Hagar, chief of the survey. This gentleman is well known to the scientific men of the country in connection with his work upon the survey of Vermont, of which a very valuable report was issued by him.

In his preliminary examination of the mineral resources of Missouri he was gratified to find the amount of lead greater than was supposed. In reference to the much vexed question whether Missouri contains tin, he remarks that although an assay of the ore furnished a button of tin at the bottom, yet he is not entirely satisfied that this was not the result of some attempt to deceive him, as he could find no evidence in the rock itself of its being tin-bearing. He evidently considers the case as not proved, and awaits the result of farther careful experiments on the subject.—*Paper*.

ARTIFICIAL VOLCANOES.

Mr. Von Hochstetter has made some interesting experiments illustrating the phenomena of volcanoes. For this purpose he melted sulphur in water under a steam pressure of two to three atmospheres, during which a certain amount of water was taken up by the sulphur. A large quantity of

this melted sulphur was then poured into a deep wooden vessel, and, in cooling, a crust was formed upon the surface. A hole was made in this crust and kept open, and through this, as the congelation of the sulphur proceeded, eruptions of melted sulphur, with exhalations and explosions of steam, took place at regular intervals; and after a short time a miniature volcanic cone was formed, with all the characteristics of a volcano made by successive lava streams.—12 *A*, 1870, *Dec.* 29, 179.

THE MICROSCOPE IN GEOLOGY.

The microscope has rendered its aid to an immense number of branches of physical investigation in turn, and quite lately its value to the geologist has been shown by the researches of Mr. David Forbes and others. Mr. Allport, in a recent communication, gives, as the result of many hundreds of sections of rocks and minerals, the assurance, first, that the mineral constituents of the melaphyres and other fine-grained igneous rocks may be determined thereby with certainty—a result which has not been attained by any other method of examination. Second, that the mineral constituents of the true volcanic rocks and of the old melaphyres are generally the same. Third, that the old rocks have almost invariably undergone a considerable amount of alteration, and that this change alone constitutes the difference now existing between them and the recent volcanic basalts.—5 *A*, *Oct.*, 1870, 430.

ANDREWS ON THE CHRONOLOGY OF AMERICAN LAKES.

Professor Andrews, of Chicago, in a memoir published by him upon "The North American Lakes (Michigan and Huron especially), considered as chronometers of post-glacial time," comes to the following conclusion in regard to their history and chronology, assuming that their formation took place during or at the close of the drift period: "1. The upper beach of the lakes began to form immediately after the boulder-drift period, and continued to accrete for about nine hundred years. No animal fossils have yet been found in it. 2. The waters then fell suddenly to about their present level, where they remained till a thin bed of peat accreted on the marshy slope vacated by the waves. Data are not at present available for a calculation of this low-water period, but

from the position of the soil-bed in the eastern dunes it probably lasted five hundred years. 3. The water rose again, submerging for a short time the upper beach, but soon fell to the line of the middle one, where it remained about one thousand six hundred or two thousand years. This period appears to be contemporary with the loess. 4. The water, which had already slowly fallen some feet, now retired more rapidly to near its present level, which it has maintained with only moderate fluctuations ever since. 5. The total time of all these deposits appears to be somewhere between five thousand three hundred and seven thousand five hundred years." —*Trans. Chicago Acad. Sci.*, 1870, 23.

ACTION OF ICE ON THE NORTH AMERICAN COAST.

According to Professor Shaler, due consideration has not been given by American geologists to the influence which ice has exerted in shaping the outline of our coast, since he is convinced that, among other illustrations of this fact, the eastern portion of Cape Cod has been produced by glacial action. Though of recent formation, this feature of the coast is important, in a zoological point of view, as furnishing a well-marked boundary-line for the fishes, invertebrates, and marine plants of the coast. Long Island is likewise, according to Professor Shaler, made up of masses of material laid down in a confused manner under water. These masses came from the north, and are the product of the ice-sheets which poured out from the rivers running southerly and emptying into the Sound. Chesapeake and Delaware Bays also exhibit the action of ice, the material excavated from them having been borne southward so as to form Cape Hatteras, and the bars in the waters of Albemarle Sound. The Professor concludes by expressing the opinion that no evidences of glacial action south of Hatteras have been discovered.—3 *D.*

PHYSICS OF ARCTIC ICE IN SCOTLAND.

Mr. Robert Brown, in a paper upon the "Physics of Arctic Ice," especially as relating to Scotland, sums up as follows: First, after the tertiary period the country was covered over with a great depth of snow and ice, very much as in Greenland at the present day, but possibly some of the mountain-tops appeared as islands. During this and the subsequent

period glaciers plowed their way down from the inland ice, and icebergs broke off and reached the sea through the glens, then ice fiords. Second, after this the country sank gradually, as Greenland is now sinking, to the depth of several hundred feet, and during this period most of the laminated fossiliferous clays were formed. During this period boulders were deposited from the icebergs, and other floating ice drifted both from the north and south, as was also the case during the former period. Third, the country seems then to have emerged from the water, but no doubt slowly, until the glaciers finally left the country. Fourth, by this time the country was much higher than now, and the land being connected with the continent, the bulk of the present flora and fauna crept into it from various quarters, though the Alpine plants still kept possession of the higher mountain regions during a great portion of this epoch. Fifth, a depression now took place, and the estuarine beds, or *carses*, of the Scotch rivers were formed. Much of the fossiliferous boulder clay, formed as he has described it, is now under the sea, off the coast remains of its fauna being continually dredged up. Man had also by this time got into the country. Sixth, the land after this seems to have risen, in all probability, to its present altitude, for we have no certain evidence that since the dawn of history there were any oscillations of level.—5 *A*, *July*, 335.

WAS THE PRE-GLACIAL HEAT CAUSED BY A METEORIC BODY?

A French savant, M. De Latterade, has communicated to the Académie des Sciences the remarkable theory that during the period which preceded the glacial epoch, when the temperature of the northern hemisphere was far higher than it is at present, as evidenced by the fossil remains of the European and American tertiary formations, this accession of temperature was caused by the proximity to the earth of a very powerful star or second sun, which gave to the earth an immense quantity of heat, and which has since receded into the abysses of celestial space. M. Latterade contends that this supplementary sun did not disturb the elements of the planets, because its attractive power was less than its heating power. He states, moreover, that the heating power does

not vary with the mass, like the attractive power.—(Communicated.)

GLACIERS IN THE WHITE MOUNTAINS.

Professor Agassiz, in an interesting communication, at a meeting of the American Association for the Advancement of Science, upon the former existence of local glaciers in the White Mountains, states that, whatever may have been the number of the higher peaks of the White Mountains that at any given time during the glacial period rose above the great ice-sheet which then covered the country, this mountain range offered no obstacle to the southward movement and progress of the northern ice-fields, the drift, so called, having the same general characteristics on the northern and southern sides of the White Mountains. In addition to this great sea of ice, however, he finds material evidence to prove the existence of many local glaciers at different points, and he infers that they are of more recent date. He expects hereafter to show that the action of local glaciers of the White Mountains began to be circumscribed within the areas they covered after the typical drift had, in consequence of the melting of the northern ice-sheet, been laid bare in the Middle States, in Massachusetts and Connecticut, and even after the southern portion of Vermont and New Hampshire had been uncovered, and when the White Mountains, the Adirondacks, and Katahdin were the only ice-clad peaks in that part of the country.—5. *D*, 1870, 550.

WESTERN TERTIARY FOSSILS.

Professor Meek, in describing some species of certain fossils collected by Mr. Clarence King, remarks that the trilobites from Eastern Nevada are decidedly primordial types, and, as far as known to him, the first fossils of that age yet brought in from any locality west of the Black Hills. The collection also establishes the fact that the rich silver mines of the White Pine district occur in Devonian rocks. He also states with regard to the fresh-water tertiary shells collected by Mr. King and others from the interior of the continent, that neither the beaks of the bivalves nor the tips of the spire in the univalves are ever in the slightest degree eroded, the most delicate marking of these parts being perfectly pre-

served, unless broken by some accident. From this fact Professor Meek infers that the waters of the lakes and streams were, during the tertiary epoch, more or less alkaline, as is the case with a large number of those found there at the present day.—4 *D*, vol. L., 423.

ANIMAL ORIGIN OF PETROLEUM.

As a counterpoise to the suggestion of some geologists that petroleum and asphaltum are of vegetable origin, it is now maintained that these substances are derived from animal remains. This latter view is thought to be substantiated by the fact of the absence of iodine, which would have been present if derived from sea-weeds; and also, on the other hand, by the presence of ammonia, which does not belong to the vegetable kingdom. Furthermore, asphaltum and bitumen frequently occur in strata which are rich in animal remains, from which they may have been derived by the action of intense heat with great pressure.—1 *C*, 1871, III., 48.

ORIGIN OF COAL FROM SEA-WEEDS.

A French geologist, in a memoir upon the origin of coal, takes the ground that it is derived entirely from marine plants, such as fucus, or sea-weed, which are destitute of woody fibre; and that its first place of deposit must necessarily have been at the depth of the sea, and in a place different from that in which these plants had their growth. The arguments adduced by him are varied and ingenious, and will doubtless be responded to in due course of time by those who maintain that the same substance was derived from the gradual accumulation of terrestrial plants of somewhat varied forms.—7 *B*, *June* 4, 212.

ORIGIN OF THE PHOSPHATE BEDS OF SOUTH CAROLINA.

Professor Kerr, in a communication before the American Association upon the origin of the South Carolina phosphates, is inclined to refer them to accumulations of a species of *Lingula*, a mollusk (or a worm, according to Mr. Morse), which has recently been discovered in abundance along the sounds of North and South Carolina. The shell of this animal, he states, consists of phosphate instead of carbonate of lime, and its habitat is at the precise level of the Ashley

River phosphates. As the shells are very fragile and easily comminuted, he thinks that this solid material, accumulating, has been agglomerated by some force into the nodules which are so peculiar to the formation in question.—5 *D*, 1870, 571.

ENCROACHMENTS OF THE SEA IN YORKSHIRE.

In a paper upon "The Encroachments of the Sea" on the east coast of Yorkshire, by Rev. T. O. Morris, read before the last meeting of the British Association, it was stated that on the average there had been a loss of land of from two to three yards every year—probably about two and a half to two and three quarter yards per annum. If looked at in round numbers, the waste of land, at three yards in each year, would amount to nearly thirty-nine acres between Spurn Point and Flamborough Head alone; or in a hundred years to 3900 acres, which, at the value of £30 or £50 per acre, would represent a serious money loss of grain or other crops; or, taking the waste, as had been calculated, at one mile since the date of the Conquest (1066), the money value in that interval, at £30 per acre, would be equal to £691,200; or, at £50 per acre, no less than £1,152,000. In conclusion, Mr. Morris recommended that a sea-wall of roughly hewn, or even unhewn, stone be laid at an angle of thirty-five degrees, which he thought would be a permanent protection from encroachments.—18 *A*, *August* 25, 562.

HYDRO-GEOLOGY.

The Abbé Richard, it is said, claims to be so successful in indicating places where water can be found that he is called "the prophet of water." During the meeting just held of the British Association, the abbé presented himself before that body, and gave a long list of places where, under his direction, water had been obtained, and stated that the knowledge he possessed of this law, by which he was enabled to make these discoveries, was his own property. He would not reveal this before he had seen as many countries and soils as possible, in order to support his theory on the greatest possible number of facts. He asserted that it is possible, by the inspection of the soil, to recognize the existence of hidden springs; and not only water springs, but that every thing liquid comes under the same law, and that, consequently,

springs of naphtha and petroleum oil can be discovered by the knowledge of this hydro-geological law, as he terms it; and, in fact, he claimed the discovery of several such springs in the Carpathian Mountains.—18 *A*, *August* 25, 562.

REMAINS IN THE CAVES OF THE ALTAÏ.

Professor Brandt, in a memoir upon the remains of mammals discovered in the quaternary formation of the caves in the Altaï Mountains, remarks that a great majority of the species belong to forms still living in the same mountains; or, as in the case of the boar and the beaver, exterminated there within a recent period, the total number hitherto determined amounting to about one third of the species of the present fauna. A few of the remains, however, such as those of the cave hyena, Irish elk, the primitive ox, the fossil rhinoceros, and the mammoth belong to animals of the existence of which in later times there is no historical evidence, not much reliance being placed upon an alleged tradition of the Tartars of Southern Siberia in regard to the occurrence of giant animals, with which their ancestors were in the habit of contending. Another animal found in these caves is the horse, of which no wild specimens occur at the present time in Siberia. The bones of this animal seem in rather better preservation, and, consequently, of newer introduction than those of the extinct species just mentioned. A similar condition of preservation attaches to bones of the bison, while those of the primitive ox have lost their organic matter almost in the same proportion as the mammoth and other species. From this Professor Brandt concludes that the primitive ox was exterminated in Asia as well as in Europe earlier than was the case with the bison and the wild horse; this being due, perhaps, in the case of the ox, to the more palatable nature of its flesh when compared with that of the bison. Finally, our author remarks that, even if the coexistence of man in Siberia and the colossal and extinct animals can not be established on palæontological and archæological data, although indicated perhaps in some obscure sagas, yet we may assume it with tolerable certainty, as we know that he lived in Europe unquestionably at the same time with the mammoth, rhinoceros, Irish elk, bison, and the auerochs, and possibly even emigrated from Asia at the same time with them.—*Brandt*, *Mélanges biologiques*, VII., 434.

SEVENTH REPORT ON THE KENT'S CAVERN EXPLORATION.

In the seventh report on the Kent's Cavern Explorations, made by Mr. Pengelly to the British Association, it is stated that the usual section of the floor in a descending order consisted of, 1. Black mould, containing many objects of recent date, and some of Romano-British times; also remains of animals still living, or which lived in historic times. 2. Granular stalagmite, containing remains of extinct animals, and also a human jaw. 3. Cave earth, yielding a harvest of extinct remains; also flint implements. 4. Crystalline stalagmitic floor, and Breccia formed of rocks from distant hills; bears only have been obtained from these.

Mr. Pengelly describes the work done during the past twelve months, showing what new passages had been opened, and the number of species which had been obtained. They included hyena, horse, rhinoceros, Irish elk, ox, deer, badger, elephant, bear, fox, lion, reindeer, rabbit, bat, wolf, dog, etc. Many of the bones were gnawed by hyena; others were marked by rootlets encircling them. Altogether about 2200 teeth and bones, and 366 flint implements and flakes, had been obtained since the last year's report was read.—12 *A*, *August* 24, 332.

CLASSIFICATION OF THE PALÆOLITHIC AGE BY MEANS OF THE MAMMALIA.

Mr. Boyd Dawkins, in his paper on "The Classification of the Palæolithic Age by means of the Mammalia," stated that the method of classification of this age by reference to the mammals associated with man was not of any value. M. Lartet divided the palæolithic age into four stages—that of the great bear, that of the mammoth and woolly rhinoceros, that of the reindeer, and that of the aurochs. The essential basis of this classification lay in the *à priori* consideration that the animals of the palæolithic age came into Europe one by one. It was, however, found by observation that they were fairly distributed in the caves and river deposits of Europe, and very generally together—as, for instance, in Kent's Hole. The same negative conclusion applied to the caves of France and Belgium, and in the latter country, indeed, the reindeer was probably living in the neolithic, bronze, and

iron ages, since it lived in the Hyrcanian Forest in the days of Julius Cæsar. For the truth of M. Lartet's classification, it was considered essential to show that these animals invaded Europe in a definite succession; and as evidence of this is wanting in the present state of our knowledge, it follows that the chronological value of M. Lartet's classification must be regarded as inadmissible.—18 *A*, *August* 25, 562.

PHYSICAL GEOGRAPHY OF NORTH AMERICA IN THE PLIOCENE PERIOD.

In a review by Mr. Boyd Dawkins of Professor Leidy's recent great work on the fossil mammals of North America, while discussing the distribution of animal life in America during the pliocene period, he shows that it furnishes important information in regard to the physical geography of the continent at that period. Thus the absence of edentata, as well as of the opossum, and of the South American forms of rodents, implies that North America was separated from South America by an impassable barrier—this, of course, being water. At that time the Isthmus of Panama probably did not exist, so as to form a bridge connecting the two lands, over which animals could cross. On the other hand, however, the genera belonging to the basin of the Upper Missouri indicate an unmistakable inroad of animal forms from some other region. Thus the deer, the mastodon, the elephant, the hipparion, and the horse, together with the wolf, could only have been driven from Europe and Asia, with which there was evidently a connection during both the pliocene and miocene epochs. During the quaternary period this separation from South America no longer existed, and the South American forms seem to extend northward to a considerable distance in North America, thus showing the period of the elevation of the Isthmus of Panama to have been a portion of the post-pliocene or quaternary period. With all this, however, no barrier seems to have existed between North America and what we now call the Old World, since many forms continued to be common to both, such as the bisons, horses, moose, mammoth, musk-ox, etc.; and we are therefore entitled to assume that North America was separated from Asia at Behring's Straits during a comparatively recent period. From the evidence adduced in Dr.

Leidy's work we see an additional illustration of the fact that certain forms which belong to a given formation in Europe continued during a succeeding formation in America after having become extinct in Europe. Thus, while various European miocene genera occur in the American pliocene, so the mastodon and hipparion, which died out in the European pliocene, existed in America during the post-pliocene. And again, the musk-ox of the post-pliocene of Europe, now extinct there, still exists, living in abundance, in arctic America. Illustrations of this law are familiar to palæontologists both in the animal and vegetable world, in some instances being based upon specific identities, and in others upon generic relationships.—12 *A*, *July* 21, 232.

MICROSCOPICAL SECTIONS OF ROCKS.

The *Mechanics' Magazine* for September 30 contains an account of an improved apparatus for the preparation of sections of rock for microscopic examination. This branch of investigation, within a few years past, has become of much importance, and in the hands of Mr. Forbes and others is furnishing valuable results in determining the true character of rocks, and frequently much more satisfactorily than would be possible by the best chemical analysis.—3 *A*, *September* 30, 1871, 250.

DEEP BORINGS.

It is reported that, in boring for salt at Sperenberg, near Berlin, Prussia, they have penetrated to the enormous depth of 5500 feet—the greatest depth ever reached either by mining or boring—3200 feet of this being in a bed of solid salt, which has not yet been pierced through. It is thought probable that this stratum of salt, originally horizontal, has been uplifted by some catastrophe and brought into a more or less inclined or even a vertical position. Further researches will prove or disprove the truth of this explanation.—1 *C*, 1871, XIII., 208.

SILVER MINE AT LAKE SUPERIOR.

Allusions have lately been made in the public papers to the discovery of a silver mine on an isolated rock in Lake Superior, which is being worked under the protection of a

coffer-dam. According to Mr. Dubois, of the United States Mint, this ore becomes richer with the increasing depth, and is now yielding at the rate of $13,000 a ton.—*Pr. Am. Phil. Soc., December*, 1870.

NEW MINERAL OIL LOCALITIES.

An extensive bed of bituminous slate has been discovered eighty miles from Sydney, Australia, near to the western slope of the Blue Mountains, and a large establishment has been erected for the purpose of obtaining oil. The seam is horizontal, and from five and a half to six feet thick, in stratified sandstone. About one hundred tons of the slate are worked up weekly. The crude oil first obtained is subsequently converted into burning-fluid, lubricating oil, etc. In that portion of India, also, adjoining the mountains of Persia, principally occupied by the cretaceous and tertiary strata, sufficient traces of petroleum have been found to make it important to make further investigations. Petroleum has likewise already been obtained in the vicinity of Gunda.

NEW LOCALITY OF TIN.

The attempt to discover tin in workable quantities in the United States has been rather a failure, since, notwithstanding the many enthusiastic announcements of the finding of mines of this valuable metal in Missouri, Utah, and elsewhere, it would appear that the metal itself is not forthcoming. The latest account from the Utah mines is that the substance in question is cadmium, which, although valuable, is perhaps less so than tin, in view of the threatened exhaustion of the best-known mines. It is now reported that some rich deposits have been found in the Department of Lozère, in France. —15 *A*, *November* 11, 1871, 629.

CAUSE OF SMOKINESS IN QUARTZ CRYSTALS.

Mineralogists are well aware that in 1868 a large number of crystals of smoky quartz were found in Switzerland, which furnished specimens of great beauty and size to many cabinets throughout the world. In the course of an investigation into the physical characters of some of these crystals, it was found, much to the surprise of the experimenter, that on heating they lost their smoky appearance, and became as

limpid and colorless as the most beautiful rock crystal; and this suggested the inquiry whether the color was due to the inclusion of organic substances which were destroyed by heating, or to some change of the molecular constitution of the crystal caused by the heat. To determine this question, Professor Forster subjected a series of these crystals to a careful examination, and, as the result, came finally to the conclusion that the black color was not the result of any peculiar molecular condition, but that it was produced by the presence in the crystal of bodies containing organic carbon and hydrogen.—15 *C*, XVIII., 283.

GLACIERS OF SPITZBERGEN.

According to Captain Koldeway, of the *Germania* steamer, the glaciers of Spitzbergen differ especially from those of Switzerland in stretching down into the sea, where they end in a perpendicular wall, and in having the upper surface somewhat polished, and free from all roughness and ice-blocks. In the glaciers examined at Augusta Bay and William Island there were no crevasses. Moraines, however, occurred, those of the great glacier of the former locality consisting of limestone and basalt.—12 *A*, *April* 6, 1871, 454.

VALLEY GLACIERS IN NEW ENGLAND.

In discussing the glacial period in New England, some years ago, Professor Dana announced his belief that the under part of the great continental glacier, lying in the Valley of the Connecticut, moved in the direction of the valley, either while the glacier was at its maximum thickness and held on its southeasterly course, or after its partial decline. He now, in the October number of the *Journal of Science*, proceeds to state the evidence in regard to the Connecticut Valley movement, and to show that other large valleys of Central and Western New England had also, in the same sense, their valley glaciers; that is, they determined the direction of the ice that lay within them. The facts appealed to for the support of these conclusions are drawn partly from his own observations, but also from the reports of Dr. E. Hitchcock, Professor C. H. Hitchcock, Professor Hagar, and others.

These observations show that on the higher lands, both

east and west of the Connecticut, the great continental glacier had a southeastward course, varying somewhat in particular latitudes, and that it moved over the elevated lands to the east of the river, keeping right onward, with little variation in its main movement, notwithstanding the ridges in its course, and probably following the general slope of the surface of New England. This being true of the movement of the main mass, other facts show that the bottom ice of the great glacier often followed the courses of the valleys beneath it.

He also discusses the question whether the scratches in the valleys were made in the glacial era, while the glacier was of nearly or quite its maximum thickness, or during the decline of the glacier, when its thickness was so diminished as to make the ice of the valleys essentially independent glaciers, and comes to the conclusion that the valley ice in the Connecticut had, throughout its southern half, its own independent southward motion, mostly unmodified, during the whole progress of the glacial era, but that among the more northern part of the valley there were modifications in the valley movement referred to, and also scratches made by the general glacier.—4 *D*, *October*, 1871, 233.

GREAT CONTINENTAL GLACIERS.

In the preceding article we give an abstract of Professor Dana's paper in the *American Journal of Science* upon the great continental glaciers of North America, and in the November number of that magazine he continues this highly interesting topic, and proceeds to investigate its source, or the position of the great plateau which constituted the starting-point of the glacier movement. After a full discussion of the direction of the rock scratches at different points in New England and Canada, he comes to the conclusion that the region of greatest elevation in question along the water-shed and that of the icy plateau must have been situated between Lake Temiscaming and Lake Mistissinny, and that its trend was consequently northeast and southwest, this being nearly that of the water-shed between the lakes—a trend just right for a southeast movement of the ice. The height of this Canadian water-shed must have been at least four thousand five hundred feet greater than at the present time.

The present difference from that level is not due, in all probability, to denudation, but rather to a subsequent depression of the level of the surface following the previous elevation. This elevation of the surface of the land of Northern Canada into a great plateau at least as high as the summit of Mount Washington, with the less elevations north and south as a part of the great swell of the surface, and with the simultaneous elevation of other, perhaps higher plateaus over the more northern and northwestern portions of the continent, and all following the majestic uplifts of the tertiary, would have made a *glacial* period for North America, whatever the position of the ecliptic, or whatever the eccentricity of the earth's orbit, though more readily, of course, if other circumstances favored. Having the most elevated land of eastern North America along the region pointed out, the courses of the winds and the distribution of moisture would have been different from the present. Canada, being then on the seaward slope of the high land, instead of, as now, on the landward slope, could not have had its comparatively dry climate with only an annual fall of thirty inches of moisture. According to Professor Dana, in the subsidence of this plateau it is probable that the same region was depressed even below its present level, this probably initiating the melting of the glacier, followed by a return movement, with possibly minor oscillations during the same period.—4 *D*, *Nov.*, 1871, 373.

BROWN ON THE INTERIOR OF GREENLAND.

Dr. Robert Brown, in a communication on the "Interior of Greenland," states that the result of all the attempted explorations of the interior goes to show that this is one huge *mer de glace*, of which the outlets and overflow are the comparatively small glaciers on the coast, though, when compared with the glacier system of the Alps, they are of gigantic size. The outskirting land is, to all intents and purposes, merely a circlet of islands of greater or less extent. There are, in all probability, no mountains in the interior—only a high plateau, from which the unbroken ice is shed on either side to the east and west, the greater slope being toward the west. No mountains have been seen in the interior, the prospect being generally bounded by a dim, icy horizon. Dr. Brown considers Greenland susceptible of being crossed from side to side with

dog or other sledges, provided the party start under experienced guides, and sufficiently early in the year.—15 *A, August* 19, 1871, 247.

REPORT ON THE GEOLOGY OF JAMAICA.

A report on the geology of Jamaica, by Mr. James G. Sawkins, has recently been published by the British government, and, in the interest attaching to the West Indies at the present time, furnishes an important addition to our means of obtaining a thorough acquaintance with that region. The physical geology and the special structure of the island are given in considerable detail in this work, which is accompanied by a large map of the island, suitably colored to show the different geological formations. Several appendices are given in the volume, one of them being a complete classification of the organic remains of the island, by Mr. Etheridge, who refers them respectively to their equivalents in the cretaceous and tertiary deposits of Europe. According to Sir Roderic Murchison, the practical conclusions to be reached from the report of Mr. Sawkins and the appendix of Mr. Etheridge are that, in Jamaica, as in most of the West India islands, the principal geological deposits are almost exclusively of the miocene age of the tertiary series, the only exceptions being in Trinidad and Jamaica, where eocene and cretaceous formations occur. Hence it follows that the igneous rocks which are associated with such deposits are for the most part either of the miocene age or posterior to that era, some of them, indeed, having been recently erupted.

SEA BOTTOM ALONG THE ATLANTIC COAST OF THE UNITED STATES.

At a meeting of the Boston Society of Natural History a communication was presented by Count Pourtalès in reference to the character of the sea bottom off the coast of the United States south of Cape Hatteras, and based upon the researches of the Coast Survey. According to his statement, the principal constituent of the coast is silicious sand from the coastline to about the line of one hundred fathoms—a limit which coincides nearly with the inner edge of the Gulf Stream throughout the greater part of its course. Outside of this line is a whitish calcareous mud, containing globigerina, and

extending probably over the greater part of the ocean. South of the Vineyard Islands, and to the eastern end of Long Island, the silicious sand is replaced by a kind of bluish mud known as the Block Island soundings. A similar mud is found off Sandy Hook in a range of depressions known as mud-holes, which form a leading mark by which to find the port of New York in thick weather. A few rocky patches are found east of the neighborhood of New York, and a rocky bottom occurs, sparingly, near Cape Fear, but otherwise the sand is pretty uniform, varying only in the size of its grain. On the inner edge of the Gulf Stream there is a deposit of green sand composed of the cast-off foraminifera.

DIMINUTION IN THE SIZE OF SWISS GLACIERS.

Owing to various climatological causes, a remarkable decrease in the lower borders of the Swiss glaciers took place during the year 1870, and careful trigonometrical measurements of their summits revealed a corresponding depression. One ice-peak in the Tyrolese Alps, which formerly was a little over eleven thousand Vienna feet in height, has been reduced, within a few years past, to the extent of eighteen and a half English feet, leaving only three instead of four points in these Alps reaching the former altitude.—7 *C, G* 71, v., 304.

LAND-SLIDES.

During the present year there has been an unusual number of land-slides and sinkings of the ground over considerable areas in different parts of the country, one of the most striking being the dropping out, so to speak, of a portion of the harbor of St. John, New Brunswick, last winter. Quite lately, again, three acres of land on the Delaware division of the Erie Railway suddenly sank below the ground to the depth of about forty feet, leaving the tops of the trees just visible above the surface. As an instance of a more gradual sinking of an extended region, it is said that the islands of Jersey and Guernsey, in the British Channel, have subsided to the extent of forty feet in five hundred years.

CONNECTION OF EARTHQUAKES WITH MAGNETIC CURRENTS.

Mr. Varley has lately expressed the belief that many earthquakes are due to the action of magnetic currents through

the body of the earth, basing this impression upon the frequent coincidence of violent disturbances of the magnetic needle with earthquake shocks. This view is corroborated by a recent communication of Professor Sumichrast, an eminent naturalist residing in Mexico, who expresses the opinion that it will not be far from the truth to state that the majority of earthquakes experienced in Mexico are due to magnetic agencies rather than volcanic, the concurrent deviation of the magnetic needle, the sudden heating of the atmosphere, etc., seeming to point to magnetic action.

PHYSICAL PHENOMENA IN ECUADOR.

In a recent report of the governor of the province of Leon to the general government of Ecuador, it is stated that in February, 1869, noises were heard on the mountains of the Western Cordilleras in the vicinity of Cotopaxi, and that immense masses of earth and rock were thrown out, while springs of water burst forth in such quantity that the rivers were overflowed and much damage done, the phenomena being unaccompanied, however, by earthquakes. The climate, too, seemed to have become much hotter than previously, many kinds of plants having flowered that had never done so before, and the sugar-cane being fit to cut in twenty-four months instead of thirty. Since 1869 the springs have all dried up, and the volcano has become inactive, and from these indications it is feared that a new disturbance is breeding which may produce great damage on breaking out.—*Panama Star and Herald, June* 1, 1871.

GEOLOGY OF THE ALPS.

Les Mondes for October 5 coutains elaborate articles by Elie de Beaumont and Sismondi upon the geology of the Alps, in connection with the Mont Cenis Tunnel, in which full details are given of the structure of this mountain chain, and of the history of the enterprise connected with its perforation.

In regard to the geology of the Alps, Mr. Sismondi sums up with the following conclusions: first, that the anthracitiferous rocks of the Alps constitute three groups, differing from each other in the nature of their rocks, in variance of level in their beds, and in the remains of organic substances which they contain; second, the order in which the rocks

succeed each other, from below above, is the same as that in which they were originally deposited; third, the contortion of the beds is a purely local incident, the folds of one group never extending to another associated with it; fourth, the three groups of rocks are folded simultaneously in the form of the letter V—that is to say, like the sides of a boat, a folding which does not alter the original order; fifth, the vestiges of carboniferous plants have hitherto been found in only two groups, the lower and upper; sixth, in the middle group animal remains of the three liassic orders have hitherto been alone found, and these mixed together, all equally well preserved, and in the upper benches some remains of the oolitic period; seventh, in the inferior group the rocks with vegetable impressions are associated with others containing casts of liassic mollusks, which are entirely wanting in the upper group; eighth, impressions of leaves predominate in the lower group, and of stems in the upper. Besides these, in the lower group there are found scarcely any traces of anthracite, while this combustible is very abundant in the upper group. For these and some other reasons, which our space will not permit us to reproduce, Mr. Sismondi is led to assent to the inference of Mr. De Beaumont, that the three groups of rocks in question belong to one and the same geological formation, namely, the Jurassic.—3 *B*, *October* 5, 1871, 64.

OIL IN NOVA SCOTIA.

According to a recent account, a company which has been boring near Lake Ainslie, in Inverness County, Cape Breton, struck oil a short time ago at a depth of 560 feet, with every prospect of securing an ample supply. The discovery has created quite a fever in Nova Scotia, and companies are being formed, and large tracts of land secured, for the purpose of going into the oil business.—*N.Y. Shipping List, Dec.* 28, 1870.

NEW VARIETY OF CANNEL COAL.

A new and remarkable variety of cannel coal has recently been announced in the *American Gas-Light Journal* as having been lately discovered on the Red Bank River, in Armstrong County, Pennsylvania. It is a variety of cannel coal, but has the curious peculiarity that when cut, or even rubbed with a knife-blade, it assumes a brilliant lustre precisely

like plumbago. It easily streaks paper, the streak having a slightly olive-brown tinge, and being indelible by India-rubber. As a combustible it is of excellent quality, and as such will doubtless be soon brought to the notice of the public.—*Gas-Light Journal, December* 3, 1870.

GUANO IN THE LOBOS ISLANDS.

A scientific commission in the interest of the government of Peru has lately been investigating the guano deposits of the Lobos Islands; and it is reported that the result of their inquiries has been satisfactory, and that immense quantities of very rich guano, equal, if not superior to that of the Chincha Islands, have been observed. The analyses of samples are said to have yielded over thirteen per cent. of ammonia. —*Panama Star and Herald, November* 2, 1871, 7.

FORMATION OF THE NEW ENGLAND COAST.

Professor Shaler considers that the Chesapeake and Delaware bays, like many of the deep gorges in Switzerland and elsewhere, were formed by the action of ice, and that the existence of Cape Hatteras is due to the uplifting of the rocks on which Richmond is situated. The sand-bars on the coast he believes to have been formed by the material dug out of the Delaware and Chesapeake bays by this ice action, and worked southward by the united force of the floods and currents. He finds that, after we pass these bars, south of Weldon the sea-bottom is totally distinct in character, being purely submarine, and formed by the action of the sea. He points out the existence of a rise and fall of the coast at different portions of its extent; this, in the most recent geological period, amounting at Charleston, South Carolina, to from 50 to 60 feet; in Maine to 200 feet; and to a still greater degree on the coast of Labrador. As a general rule, he thought there was evidence to prove that, taking a line from the centre of the continent to the centre of the sea, the sea-floor was coming up and the high elevations were coming down.

Mr. Hyatt states that observations made by the Coast Survey showed that the coast of Long Island Sound, and southward in New Jersey, has been sinking, while the Florida Keys are rising; and Mr. Niles remarked that, from the earliest times, in the Adirondacks and different points southerly, there

had been peninsulas corresponding in position to Florida, and that this is simply the most southern, and latest of a succession from north to south.—*Pr. Boston S. Nat. Hist., February.*

FOSSIL FOREST IN CALIFORNIA.

Professor Marsh, in the *Journal of Science*, referred to a locality in California abounding in fossil trees to such an extent as to constitute a veritable forest. The region in question is sitting on a high, rocky ridge in Napa County, California, near Calistoga Hot Springs, and about ten miles from the summit of Mount St. Helena. The ridge itself belongs to the Coast Range series, and forms the divide between the Napa and Santa Rosa valleys. It is about two thousand feet in height, and is composed of metamorphic rock of the cretaceous period, overlaid unconformably by later tertiary strata, consisting of light-colored, coarse sandstone, and beds of stratified volcanic ashes. A careful examination showed that the trees on the surface of the ground had been weathered out of the volcanic tufa and sandstone, and consequently were of the tertiary age; and also that there remained still imbedded in the volcanic tufa, etc., an extensive forest of very large trees, stretching over a great area. Some of the trees were of great size, a portion of one having been traced for a length of sixty-three feet, with a diameter of seven feet nearer its smaller end. Another tree indicated an original diameter of not less than twelve feet. All were prostrate, and had apparently been thrown down by the volcanic current which covered them. Many were much decayed internally and worm-eaten before they were buried. All of the wood was silicified, probably by means of hot alkaline waters containing silica in solution—a frequent result of volcanic action.

A careful examination of the wood obtained at this locality showed no essential difference in structure from that of the modern red-woods of California (of the genus *Sequoia*). No other fossils were met with, which rendered it somewhat difficult to fix the precise epoch; but it is considered probable by the professor that the trees belonged to the pliocene period. The origin of the volcanic material which covered the forest could not be ascertained, although it was supposed to have been derived from Mount St. Helena, which is the nearest volcanic peak.—4 *D, April,* 1871.

F. GEOGRAPHY.

PROBLEMS IN PHYSICAL GEOGRAPHY.

A recent number of *The Academy* contains a notice, by Keith Johnston, Jun., of a collection of essays by Oscar Peschel, composed of a series of articles published in *Ausland*, a weekly journal of geography and anthropology, of which Dr. Peschel was editor until quite recently, when he was succeeded by Dr. Bocmeister, and still more lately by Fr. von Hellwald. The subjects discussed in these essays consist of certain problems in comparative geography, in this instance restricted more to the purely physical conditions of the earth than is the case in the well-known work of Carl Ritter, which Peschel thinks should be entitled "Geographical Theology, or an Attempt to Penetrate the Design of the Creator from a Study of his Works." Various subjects are treated of in this series, among the more noteworthy of which, according to Mr. Johnston, may be mentioned that on the formation of fiords, which are deep and precipitous cuttings into a steep coast, generally at a high angle, and are usually aggregated together considerably wherever they occur. They are found only on the coasts of Europe and America, and mostly on west or north coasts, being confined in Europe to regions north of the fifty-first parallel; on the east coast of America to the forty-fourth, and on the west coast to above the forty-eighth degree. In the southern hemisphere no fiords occur within a limit of forty-one degrees from the equator. On a careful examination of these fiords, their bounds are found to agree with the winter isothermal lines, none of them occurring in any warmer zone than that shut off by a yearly temperature of 50° Fahr. Within this space, however, they never fail to appear where a steep coast-line and heavy rain-fall are seen to exist together. In general they are either channels through which glaciers find their way at present to the sea, or show marks of having been formerly occupied by them.

In answer to the question whether these physical features may not have been produced by glaciers, Dr. Peschel responds

that they mark the outlines of a former and now retreating glacial covering, which has protected these remains of still earlier upheavals from the weathering and degradation which has befallen any such raised and broken surfaces in warmer regions.

In another essay Dr. Peschel opposes the theory of the existence of mountains and valleys in the sea bed corresponding to the inequalities of this character observed on the land, and maintains that every island is either the unsubmerged height of a sinking portion of the continent nearest to which it lies, identifiable as a former portion of the main land by its geological structure, its fauna, or its flora, or else that it has been independently raised by volcanic force or by the labors of the coral insect.

In another chapter Dr. Peschel opposes the idea that the mountain ranges have been formed by outbursts of incandescent lava; but finds in chemistry the power needed for the result, especially in the combinations of carbonic acid and silica, which produce a chemical change resulting in the reduction in specific gravity, and a considerable increase in the volume of the mass.

From a careful study of the subject, Dr. Peschel thinks he can show that since the tertiary period the continents have tended to add to their extent northward and westward, and to lose by submergence to the south and east, the gain in the one case being exactly counterbalanced by the loss in the other, the proportions of land and water remaining the same. He also considers it to be a popular fallacy that the destruction of forests reduces the rain-fall on the land, and thinks it useless to attempt planting in those countries in which woods have not flourished naturally in historic times. This idea, however, Mr. Johnston very sensibly opposes as being contrary to well-established facts.—13 *A*, *June* 1, 1871, 286.

EXPEDITION OF THE HASSLER.

The daily papers of the past summer have kept their readers advised of the preparation of the great exploring expedition upon which Professor Agassiz has been expecting to engage during the voyage of the Coast Survey steamer Hassler from Boston to San Francisco, by way of the Straits of Magellan. The expedition was originally to start as early as

July or August, and in that event the exploration in question would have commenced off the coast of the United States. Owing, however, to unexpected delays, the vessel has but recently fitted out and reported at Boston, where she has been detained, undergoing alterations of her machinery. We have already noticed the general plan and objects of the expedition. The scientific corps, as will be remembered, consists of Professor and Mrs. Agassiz, Count Pourtalès, Ex-President Hill, of Cambridge, Dr. White, Mr. James Blake, and Dr. Steindachner, each gentleman having special charge of a particular department of the work, and interested in its successful accomplishment. The vessel itself is under the command of Captain P. C. Johnson, with Messrs. Kennedy and Day as lieutenants. Owing to the lateness of the season, the original plan of making extended explorations in the West Indies and off the eastern coast of South America has necessarily been modified, and the vessel will probably proceed almost directly to the Falkland Islands and the Straits of Magellan, there to commence the comprehensive investigations proposed, as otherwise a sufficient share of the summer season of the Straits could not be secured. The Atlantic Ocean work thus given up will, in all probability, partly, at least, be performed by the A. D. Bache, a consort of the Hassler, next year.—*Boston Advertiser, N. Y. Tribune, etc.*

AGASSIZ'S PROPHECY.

Just before the departure of the United States Coast Survey exploring steamer Hassler upon its scientific mission, Professor Agassiz addressed a communication to the Superintendent of the Coast Survey, in which he ventured to assume the character of a prophet by stating in advance what it was probable would crown their efforts in the way of discovery.

The professor makes this communication in the hope of showing within what limits natural history has advanced toward that point of maturity when science may anticipate the discovery of facts. Basing his expectations upon the ascertained principles of science, and taking into consideration the relationships between different forms of animal life, and the succession of geological epochs, and in view of the very interesting results of later deep-sea dredging expeditions in

the North Atlantic, he anticipates the discovery, "from the greater depth of the ocean, of representatives resembling those types of animals which were prominent in earlier geological periods, or bear a closer resemblance to younger stages of the higher members of the same types, or to the lower forms which take their place nowadays."

Making no suggestion in regard to mammals, he remarks that if reptiles exist in the deep waters, they must be only such as are related to the extinct types of the Jurassic periods, such as the ichthyosauri, plesiosauri, and pterodactyles; but even of these he thinks there is very little probability that any representatives are still alive.

Among the fishes he expects to discover some marine representatives of the order of ganoids of the principal types known from the secondary zoological period. Among the sharks he thinks he shall find new forms allied to Cestracion, or Hybodon, or Odontaspis, as also new genera of chimæroids; and among ordinary fishes the allies of Beryx, Elops, etc. It is among the mollusks and radiates that objects of the greatest interest will probably be met with; and chief among these will be nautiloid cephalopods—perhaps even ammonites—and forms only known hitherto in the fossil state. Among Acephala he anticipates the discovery of a variety of forms resembling those from the Jurassic and cretaceous deposits in great variety, while Rudistes will take the place of oysters, and brachiopods be found very abundant.

Among Crustacea it is not at all impossible that forms may be found resembling trilobites; while among Echinoderms he confidently expects to meet with spatangoids approaching Holaster, and others akin to Dysaster, etc.

A careful comparison of the members of the deep-sea fauna of the northern and southern hemispheres will probably prove of the greatest interest, and, judging from the peculiarities of the land and shore fauna of Australia, it is likely that the adjacent deep-sea animals will be equally divergent, and represent remarkable forms, and especially of an extremely antique type.

The professor also hopes that much light will be thrown upon the subject of the geology of the southern hemisphere, and upon the general features of the drift, since all the phenomena related to the glacial period must be found in the

southern hemisphere with the same essential characteristics as in the northern, yet with this difference, that every thing must be reversed; that is, the trend of the glacial abrasion must be from the south northward; the lee side of the abraded rocks must be on the north side of hills and mountain ranges, and the boulders must have been derived from rocky exposures lying to the south of their present position. This point, however, must be established by observation. The professor thinks this will be found to be the case, with the exception, perhaps, of the present glaciers of Tierra del Fuego and Patagonia.

In reply to the possible inquiry as to what the question of drift has to do with deep-sea dredging, he remarks that the connection is closer than may at first appear. If drift is not of glacial origin, but the product of marine currents, its formation at once becomes a matter for the Coast Survey to investigate; but he expresses the belief that it will be found that, so far from being accumulated by the sea, the drift of the low lands of Patagonia has been worn away to its present extent by the continued encroachment of the ocean in the same manner as the northern shores of South America and of Brazil have been.

EXPLORATIONS UNDER THE RUSSIAN GEOGRAPHICAL SOCIETY.

Few establishments devoted to geographical research are more industrious in fulfilling their mission than the Imperial Russian Geographical Society of St. Petersburg, as shown by the bulletins of progress published monthly by its secretary. Among other enterprises recently enumerated as now under prosecution are, first, the ethnological researches of Kusnerow in the northwestern portion of the Russian empire; second, investigations of the regions along the southern and southwestern bank of Lake Onega; third, geological investigations in Finland and Sweden; fourth, investigations into the production of grain and the grain trade of Russia in the interior provinces of the country; fifth, an ethnographical expedition into the region of the Southern Ussuri; sixth, an expedition among the Tschuchchis; seventh, a scientific expedition along the Angara, for the purpose of investigating the waterfalls of this river; eighth, a number of miscellaneous enterprises of less moment; and, finally, the important jour-

ney of Count Micklucho Maclay, to which we have referred in a previous article. This, as already stated, has for its object the investigation of the islands of the Pacific Ocean; and the latest advices were received from Valparaiso on the 30th of May last. The corvette Witjas, carrying the party, was then on its way to New Guinea, which they hoped to reach within three months. The occasion of a brief halt of the vessel at Valparaiso was taken to visit Santiago, and thence the northern portion of the province of Aconcagua, this being a mountain 6834 metres in height, and considered for a long time to be volcanic, but, as was ascertained by the investigations of Piscis, having no volcanic peculiarities whatever.—3 *C*, XXXVI., *September* 4, 1871, 861.

MARSHALL ISLANDS.

The Hydrographic Office of the Bureau of Navigation of the United States has lately published a monograph upon the Marshall group of islands in the North Pacific. This group consists of two chains of islands, lying nearly parallel with each other, and running northwest and southeast from latitude 11° 50′ N. to 4° 30′ N., and from longitude 167° E. to 173° E., covering an area of over 350 by 400 miles in extent, and very little known to navigators, the information hitherto on record being considered very unreliable. The eastern chain is known as the Radack, and the western as the Ralick, each numbering from fifteen to eighteen groups of low coralline islands, the greater number of which are fully formed atolls—that is, lagoons of greater or less extent—with deep water and anchorages, surrounded by a chain of reefs, connecting islands, with one or more passages through the reefs into the lagoons, most of which are navigable for large vessels, besides which there are numerous boat passages.

The earliest discovery of this archipelago is said to have been by Laévédra in 1529, and the next visit made to them was by Anson in 1742. Since then the islands have been touched at by different navigators at various times, although until the appearance of the report just referred to but little definite information had been brought together of the archipelago as a group. A missionary establishment was started on one of these islands in 1857, which continues to be successful to the present time. The inhabitants numbered, at

the latest accounts, 10,000. They are expert navigators, and perform journeys throughout the group. They are dark, with straight hair, and are said to be intelligent and hospitable.—*Rep. Hydrographic Office.*

AURORA AND SUNDAY ISLANDS.

It has been already announced in our papers, by advices from London, that Aurora Island, in the New Hebrides group, situated about fifteen degrees east of Australia, had lately disappeared entirely, without leaving any trace of its existence; and the fact, it is said, has been corroborated by an American whaler which lately arrived at Honolulu. This island was one of the most fertile of the group, and it is stated to have been thirty-six miles long by upward of five miles in breadth. In this same connection it may be mentioned that the American whaler Milton, lately arrived at the Bay of Islands, in Northern New Zealand, reported that when they touched at Sunday Island it was on fire in all directions, and had been in that state for nearly forty days. During the heavy shocks of earthquakes preceding and after the eruptions two islands were thrown up in the harbor, one of them being, as nearly as could be judged, about three hundred feet high. Two families were living on Sunday Island, and on the arrival of the whaler begged to be taken away, as the heat was so intense and the sulphurous smell so strong that all the animals about them were destroyed, and their fate must have been the same if they had remained much longer. They were accordingly carried to the Norfolk Islands, and left there in safety.—*New Bedford Mercury.*

ANTARCTIC EXPLORATION.

The great degree of activity exhibited within the past few years in the way of arctic exploration has revived in the minds of various persons the propriety of endeavoring to solve the remaining problems of the south polar regions. A special interest attaches to this inquiry in connection with the impending transit of Venus in 1874, since, for the successful answer to all the questions depending upon the observation of this phenomenon, it is of the utmost importance to secure antarctic stations of high latitude as remote as possible from the points now known to be accessible.

Among those who have interested themselves more particularly with this question is Dr. Neumayer, who has brought it to the consideration of the Academy of Science of Vienna and the Academy of Science of Pesth; and there is now some reason to believe that the Austro-Hungarian empire will take up the subject at an early day, and dispatch an expedition, both for the purpose of scientific discovery and also for ascertaining whether an astronomical station for the observation of the phenomenon referred to can be obtained. In addition to the points already selected—namely, Kerguelen Land and Auckland Islands—a third is especially desirable in the very region where there is the most probability of penetrating to a high latitude.

For a number of years scientific inquiry was quite rife toward and in the antarctic circle, discovery following discovery in quite rapid succession. The most brilliant period was that extending from 1838 to 1843, when three great national expeditions, under the command of Admiral D'Urville for France, Sir James Ross for England, and Captain Wilkes for the United States, prosecuted their researches. It is hardly necessary to attempt a summary of what was accomplished by those intrepid navigators, or to discuss the question as to whether the lands discovered by Captain Wilkes were continental or insular. One discovery of great moment, by Sir James Ross, was that of active volcanoes in South Victoria Land having a height of 12,000 feet, access to which was barred by a wall of solid ice 200 feet in height, along which he sailed for hundreds of miles without finding an opportunity to penetrate farther into the interior. Since 1843, with the single exception of the voyage of the Pagoda, under Captain Moore, in 1845, little, if any thing, has been done to extend the area of research beyond the critical collation of log-books of sailors with a view to determine the precise nature of the ocean currents and the temperature of the sea, from which, however, important generalizations have been derived.

Of late years, as already stated, renewed attention has been directed toward the antarctic lands, largely in consequence of the publications of the Meteorological Institute of the Netherlands, in which it is shown that the current of warm water which comes from the Straits of Mozambique, and is known further south as the Agulhas Stream, does not, as orig-

inally supposed, continue round the Cape of Good Hope, but at the southern point of Africa bends around toward the east, and unites with the waters that strike along the coast of Australia, and in the region of Kerguelen Land turns more and more to the south, having been traced in that direction as far as the fiftieth degree of south latitude. How much further it goes has not yet been ascertained; but it is extremely probable, judging from the analogies of the currents of the northern hemisphere, that this may penetrate to quite a high latitude, and that it is along its path that researches are to be prosecuted which will lead more or less near to the heart of the mystery that now surrounds the south pole.

The discoveries of Ross and Weddell are really due to their persistency in following the warm currents—the first from New Zealand, and the other to the south of Cape Horn. There is the more hope of a satisfactory result in this experiment, as little special effort hitherto has been made in that direction. And if, as already stated, it is in that region that the best location for a third antarctic astronomical station is to be found, additional zest will be given to the inquiry. It is quite probable that one result of a successful exploration will be to limit very materially the supposed mass of land, as many of our best geographers maintain the existence of an archipelago of islands, firmly united by bands of ice, rather than a continent. This is an *à priori* conclusion, fortified by general climatological analogies, and can only be substantiated by actual observations.—1 *C*, XXIII., 353.

CARPENTER ON MEDITERRANEAN CURRENTS.

An interesting communication in regard to the currents of the Mediterranean has lately been made in various journals, by Dr. William B. Carpenter, based upon the result of his experiments made on board the Porcupine during the deep-sea sounding surveys in the Mediterranean in the past year. We have already given our readers a synopsis of the results obtained in the summer of 1869 on board the Porcupine, during the expeditions of which Dr. Carpenter was also a member; and although the work of 1870 does not include dredgings at such enormous depths as three miles, it is scarcely inferior in value. One of the most important points reached was the determination of a deep-sea current in the Mediterranean run-

ning to the westward, as the counterpart of the surface current from the eastward through the straits. This had been suspected for a long time, in view of the fact that a current was continually entering the straits from the Atlantic; it being, of course, readily inferred that this surface current was to restore the level of the Mediterranean, lowered by the immense amount of evaporation. In the opinion of some, the effect was simply to concentrate the salt of this inland sea and cause it to saturate the lower strata, and perhaps even to form solid beds of salt at the bottom. This supposition, however, can easily be proved to be untenable. The method adopted by the Porcupine party to show the existence of an outward under-current consisted in the use of what was called the "current drag," an apparatus so constructed as to present a resisting surface so much larger than that of the boat from which it was suspended, that although the latter might tend to move in the direction of the surface current, this would be counteracted by the action of the under-current upon the "drag." In some instances the effect was simply to retard the velocity of the surface movement, but in others the boat was actually carried against the surface current by that of a lower depth.

A chemical examination of the water brought up from great depths in the Mediterranean proved, as suspected, that the deep-sea water was more salt than that at the surface, and that, consequently, the tendency to saturation existed, but nothing could be found to show the existence of a bed of salt at the bottom; and strata of water of less density were met with below those of greater density. It will, therefore, be readily understood that the outward current in large part carries with it the excess of salt produced by the surface evaporation referred to. The cause of the circulation itself is due, according to Dr. Carpenter, to purely hydrostatic action, which he explains as follows: The water of the Mediterranean is continually losing by evaporation a larger amount than is returned to it by rain or rivers, and consequently the inflow from the Atlantic must take place to keep up this level. If this inflow consisted of fresh water, the total quantity of salt in the Mediterranean would remain the same, and the density would therefore undergo no increase. But as the upper current of salt water brings in a certain quantity of salt, in

addition to that which the Mediterranean basin previously contained, the density of this water is increased, and a column of it reaching to any given depth becomes heavier than a corresponding column of Atlantic water. Consequently the excess of downward pressure will displace the lower portion of the column of water, which will flow outward as an under-current. The withdrawal of a portion of the lower stratum will produce a renewed reduction of the surface level, taken in connection with continued evaporation, and this will occasion a further inflow of Atlantic water, which in turn undergoes concentration. And this interchange will be maintained perpetually, there being, on the one hand, a tendency to the restoration of the level lowered by excessive evaporation, and on the other a tendency to a restoration of the equilibrium disturbed by excess of pressure. The inflow and outflow will thus keep each other in check, so that neither the lowering of the level nor the increase of density will ever exceed a very limited amount.

This explanation, Dr. Carpenter thinks, received additional confirmation by the phenomena observed by the currents of the Baltic. Here an immense amount of fresh water is received from the lakes and rivers, which tends to dilute the waters of the sea. An outflow is established from the surface, which, of course, being continued without any counteracting tendency, would in time wash out every particle of salt, were it not for an under-current which brings back into it the salt water from the North Sea. Thus, while the surface current is tending to reduce the level of the Baltic to that of the North Sea, the influx of fresh water into the Baltic, and the outflow of a portion of the salt water must tend to diminish the density; and the equilibrium is maintained by the inward passage of a body of salt water from the depths. The case is, therefore, exactly the reverse of that of the Mediterranean, but such as would be expected in view of the hypothesis advanced by Dr. Carpenter.—12 *A, November 30 and April* 6; also *Contemporary Review.*

CARPENTER ON OCEAN CURRENTS.

In a previous article we have given Dr. Carpenter's account of the outward deep-sea current from the Mediterranean into the Atlantic, corresponding with the surface cur-

rent flowing inward, together with his explanation of the physical cause of this circulation. The phenomena observed have led him to suggest some striking views in reference to the currents of the ocean, especially those known as streams, and also the general movement of the entire body of water. The Gulf Stream of the North Atlantic he considers to be due by the impulse given by the trade winds to the superficial layer of the portion of the Atlantic over which they blow, creating what is known as the equatorial current, which moves constantly from the coast of Africa toward that of America, the northern portion entering the Caribbean Sea and the Gulf of Mexico, where it receives a further accession of heat, and undergoes a change of direction, in consequence of the resistance offered by the American coast-line; thence issuing in a northeasterly direction through the narrow strait between Florida and the Bahama Islands. In its course obliquely across the North Atlantic Ocean the Gulf Stream gradually spreads itself out, diminishing in depth as it increases in breadth; and when it approaches the Banks of Newfoundland, one portion of it bends round the Azores, and returns in the equatorial current, thus completing the shorter circuit of that *horizontal* movement of which the *primum mobile* is the action of the trade winds. The other portion continues its northeasterly coast past the Banks, there meeting with arctic surface currents which tend to neutralize its movement and to reduce its temperature. Of these currents, the principal, formed by the junction of the Labrador and Greenland currents, sweeps southward along the Atlantic sea-board of the United States, not only cutting this off from the influence of the Gulf Stream, but reducing its winter temperature considerably *below* the normal temperature of the latitude.

This current, however, is quite different from the general movement of the entire Atlantic Ocean, which, he thinks, takes place under precisely the same conditions as those which he has pointed out in the case of the Mediterranean. He simply substitutes in the explanation the polar basin for the Mediterranean, cooled down by the withdrawal of solar heat, and for the Atlantic the equatorial ocean. The antagonistic conditions of temperature being constantly sustained, a constant interchange between polar and equatorial waters,

through the seas of the temperate zone, may be predicted as a physical necessity. The reduction in temperature of the polar column, the whole of which may be brought down by the continued exposure of the surface to atmospheric cold almost to its freezing point, must diminish its height while augmenting its density, and thus the water of the surrounding area must flow in to maintain the level thus lowered. But when the column has been restored to an equality of *height*, it will possess such an excess of *weight* that its downward pressure must force out a portion of its deeper water, and thus an outflow of ice-cold water will be occasioned from the polar toward the equatorial area, over the sea-bed of the deepest oceanic basins, while at the same time there will be a continual indraught of warmer surface water into the polar basin, which can only be supplied by a general poleward movement of the upper stratum of the equatorial water. These movements will not have the character of currents; for it is only where the communication between the two bodies of water takes place through a narrow strait that differences so inconsiderable can give rise to a perceptible movement between them. But the movement is not the less real when diffused than it is when concentrated; and the same vertical circulation would take place between the two extremities, or between the centre and circumference of the same continuous basin, under opposite conditions as to heat and cold, as would exist if they were connected by a comparatively narrow channel or communication.—*Contemporary Review*, 1871.

THE SARGASSO SEA.

Dr. Collingwood has recently published an interesting account of the Sargasso Sea of the North Atlantic, one of several immense areas of floating meadows of sea-weed found in mid-ocean in different parts of the globe. The one to which our author refers is that which occupies the greater portion of that breadth of the Atlantic Ocean between the coast of Africa and the region of the West Indies, from 20° to about 65° of west longitude, and from the parallel of 20° to that of 45°. This area is compared to that of the Mississippi Valley; and this immense bed of floating sea-weed was at one time supposed to be derived from plants originally attached

to the bottom, and subsequently torn off by some severe storm; but it is now understood that the plants composing it increase by rapid growth, although in this condition they never produce either roots or fruit. It is therefore supposed, from their multiplying in this manner, that they are a peculiar form of one or more species described by botanists, which produce fruit only when rooting in the shallower waters, and that this growth and development may continue indefinitely for an immense number of years.

This meadow of sea-weed is remarkable not only for the immense extent of vegetation, but for the great variety of animal life abounding in its midst. Innumerable species of crustacea, many annelids, mollusca, polyzoa, polyps, and fishes are found in it. Investigations of patches of the weed always furnish a fruitful field of research to naturalists. It is mentioned as an interesting circumstance that all the animals found harboring in the Sargasso sea-weed are of the same general tint as that of the weed itself, assimilating themselves so closely that it is sometimes difficult to distinguish them at first sight. It is not at all improbable that, in view of the immense amount of minute animal life in these localities, many of our wandering fishes, such as various species of mackerel, etc., find in such places those breeding regions that we have hitherto sought for in vain.

The position of the Sargasso Sea in the Atlantic, as well as similar patches in other oceans, is believed to be determined by the course of the greater oceanic currents, as it occupies the eddy formed by the northern drift of the Gulf Stream toward the west, and its southward branch, which is deflected from the Banks of Newfoundland, and extends to the south, by the way of the Azores, along the coast of Africa.

Another tract of the Sargasso Sea is found in the Pacific, off the coast of Lower California; and still another extends along in the antarctic waters from Australia to the Falkland Islands.—9 *A*, *October*, 1870, 383.

CHARACTER OF KARA SEA.

Dr. Petermann, in a late article on the opening up of a portion of the northern Polar Sea by the voyages and observations of sundry Norwegian navigators in 1870, states that the most important result of these expeditions consists in

their showing a complete melting of the ice in the whole of the Sea of Kara, and that the few floating cakes of winter ice remaining in midsummer do not at all affect the navigability, nor the successful pursuits of hunting and fishing. Several maps accompanying the memoirs show the precise condition of the temperature and other physical features of the Kara Sea during the different months throughout the year. —17 *C, November*, 1870, 105.

EXPLORATION OF EASTERN ASIA.

Von Heuglin, the well-known explorer in Africa, has lately been turning his attention to Arctic researches, and in the summer of 1870, in company with Count Zeil, left Hamburg on the 13th of June, and Tromsö, in Norway, on the 3d of July, for the purpose of examining the unknown region of Eastern Spitzbergen. With a small boat of only thirty-one tons, and manned by seven Norwegian sailors, they reached the eastern coast of Spitzbergen, determined the position of Gillis Land, and extended greatly our knowledge of the region from 77° to 79° north latitude. They passed through the Walter Thymer Straits, which were at one time supposed to be impassable, and made collections of various kinds, including rocks and fossils, among which was a saurian eighteen feet in length.—17 *C*, 1870, 306.

RUSSIAN EXPLORATIONS.

Preparations continue to be made on the part of the Russian government, assisted by its scientific men, for the great polar expeditions of 1872 and 1873. Among the points to which special attention is to be directed are, first, in the region to the west of Nova Zembla, the determination of the cold and warm currents between the Murmanian coast and Nova Zembla; second, to decide the southern limit of the polar ice, and to take measurements of the deep seas; third, to ascertain the extension of the Gulf Stream, and what becomes of it when it meets the polar ice; fourth, to learn especially the distribution of the Gulf Stream along the coast of Nova Zembla; fifth, to fix accurately the extension of certain parts of the coast of Northwestern Nova Zembla. To the east and northeast the points to be inquired into are, first, the expansion of the Kara Sea, and all that portion of the sea

nearest to it on the east; second, to penetrate northeasterly to the limit of the polar ice; third, at least to make an effort to get as far as possible to the east, and to explore the regions along the mouths of the Siberian rivers; fourth, to make accurate geographic determinations along the least-known portions of the Siberian coast; fifth, to prosecute studies in regard to the hunting ventures of the Norwegians and Russians in Nova Zembla. These two regions of country will be intrusted to two different sailing vessels respectively, each provided with a competent commander, a specialist in physical geography, and a zoologist. The experience gained by these expeditions during 1872 is to be utilized still further in a much more extended and more completely equipped exploration in 1873, in which the same persons will take part. —3 *C, September* 25, 1871, 934.

ROSENTHAL'S EXPLORING EXPEDITION.

In a lately published number of the *Mittheilungen* Dr. Petermann gives an account of the exploring expedition of Rosenthal, of Bremen, into the Siberian Arctic Sea. This gentleman has been distinguished for some years past by his zeal in prosecuting a trading business in the high north, and for the extent to which he has connected with this inquiries into the natural history and physics of that region. The results obtained in Spitzbergen by Dr. Bessels in the voyage of one of his vessels (the Albert) are well known. During the past year he sent out the Bienenkorb, manned by Norwegian sailors, and under the command of the Norwegian Captain Melsam, to prosecute the seal fishery in the north, an experiment attended with such success that, after a short absence, the vessel returned with 6500 seals. During the present year Herr Rosenthal chartered the Germania, the well-known German exploring ship, and has sent her out, under the command of Captain Melsam and his party, accompanied by Messrs. Von Heuglin and Aagard, with an outfit and provisions for fifteen months, and all the necessary astronomical and physical apparatus. The vessel is to proceed direct to Nova Zembla, passing the Straits of Matotschkin into the Kara Sea, so as to reach the mouth of the Obi, and there to establish a harbor and refuge for heavy weather. From this point operations are to be carried on as far as possible toward the

northeast, so as to reach the northernmost cape of Asia, as well as the islands of New Siberia. In returning, the most northern portions of the main land of Asia are to be visited, and as many landings made as possible, especially near the mouths of the Obi and Jenesei. Physical observations are to be made on an extended scale, and large collections of objects of natural history gathered. Even should only a portion of this plan be carried out, such as the exploration of the region about the mouths of the Obi and Jenesei, much will have been accomplished, but it is not improbable that the entire programme will be completed.

The expedition left Bremen on the 25th of June, and proceeded first to Tonsberg, and then to Tromsö, from which point the latest advices, dated July 21, were transmitted. The expedition was to continue its voyage on the 23d of July, since which time no letters have been received.—17 *C*, 1871, 335.

NEWS FROM THE HIGH NORTH.

We are in receipt of a circular letter from Dr. Petermann, the eminent geographer of Gotha, containing more detailed information in regard to the polar discoveries lately referred to by the daily papers in the form of a brief telegram. It will be remembered that in recent articles we have given an account, among other arctic expeditions, of one under the direction of Messrs. Payer and Weyprecht, on the vessel called the Ice Bear, which sailed from Tromsö, in Norway, during the past summer. The expedition returned to Tromsö on the 3d of October, and dispatched a telegram to Dr. Petermann, stating that in September they had found an open polar sea between 42° and 60° east longitude from Greenwich, and that they had followed this as far as the 79th degree of north latitude and 43d of east longitude. Without giving any reason for not proceeding farther, they state that their route was probably much the most favorable one for reaching the pole, connecting, as they imagined it to do, with the open polar sea north of Siberia, and toward the east.

An unintelligible portion of the dispatch of these gentlemen was supposed to intimate that King Charles Land, east of Spitzbergen and near Gillis Land, extended south to 77° 12′. Dr. Petermann considers this information as of the ut-

most importance, especially in view of the fact that reports from all the other polar expeditions of the present year indicate a very unfavorable state of the ice. Full accounts of these other expeditions will be published in a forthcoming number of the *Mittheilungen.*

Dr. Petermann thinks the favorable condition of the ice for navigation in these seas is caused by the action of the Gulf Stream; and he refers to his map of 1870 (lately reproduced by the United States Hydrographic Bureau, under Captain Wyman), in which he lays down the Gulf Stream, between 75° and 76°, as having a temperature, according to Dr. Bessels, of over 41°; while an arrow, inserted there to indicate the direction of the stream, points exactly to the 79th degree of north latitude and 49th of east longitude.—*Circular of Dr. Petermann, October* 10, 1871.

DISCOVERIES OF PAYER AND WEYPRECHT.

We have already made brief mention of the important announcement received from Messrs. Payer and Weyprecht, dated at Tromsö, of the discovery of open water between Spitzbergen and Nova Zembla, in a region before this believed to be occupied entirely by ice, and have now the pleasure of furnishing some additional details received from these gentlemen by letter. Their report is addressed to the Association for Geography and Statistics at Frankfort, and is dated at Tromsö on the 19th of October. Postponing a more full account of their general adventures to a later period, they proceed at once to the announcement that in the space between Spitzbergen and Nova Zembla, which had previously been supposed inaccessible (and which, indeed, the Russian, German, and Swedish expedition in 1868 had attempted to penetrate without success), they entered a region almost entirely free from any obstacles, and in which they reached a latitude of 79 degrees without any apparent impediment to their proceeding almost, if not quite, to the pole. As, however, the *Ice-Bear* was merely a sailing vessel, and their provisions were running low, they dared not venture any farther, and accordingly returned.

They anticipate complete success, therefore, should the great expedition, which is to be prosecuted next year, follow in their course; and they remark that the key to the appa-

rent failure of explorations in this region is to be found in the faet of their starting too early in the summer, and not remaining long enough in the autumn. They think that the Gulf Stream, the current of which is clearly indicated, toward the close of the summer breaks down the barrier of iee, and clears a way into the open polar sea beyond.

The faet of their having been in the path of the Gulf Stream they consider well established by the temperature of the water (exceeding by from three to five degrees C. that of the air), the frequency of clouds and the abundance of fog and rainbows, the deeided current to the northeast, the ultramarine blue of the water, so charaeteristic of the Gulf Stream, the extraordinary riehness in lower animals, ete.

In the beginning of autumn they infer that the Gulf Stream leaves the coast of Nova Zembla and passes farther to the west, or that it then expands so as to cover a greater area. Another important result of their examinations was the discovery of an enormous abundance of whales in the open sea —a faet which will doubtless induee our Amerieau whalers seriously to consider the propriety of endeavoring to secure the reward which is likely to crown the efforts of those who may enter this new Polynia at the proper season.

During the expedition of the *Ice-Bear* a continued series of observations was taken upon the temperature, the density of the water at the surface and at various depths, the occurrence of drift-wood, the currents, deep-sea soundings, etc. Many objects of interest were taken from the bottom, and many valuable geologieal observations made.—*Circular of Geographical Society of Frankfort.*

EXPLORATIONS OF THE WHITE SEA.

In a report of a zoological exploration made in the White Sea and on the Murmanian coast in Lapland by Jarsehinski in 1869, lately published by Dr. Petermann, attention is called to the fact that while in the tropical seas the highest development of animal life is found near the surface, and diminishes with increasing depth, a precisely opposite state of things is met with in the aretic seas. Thus, in the shallow portion of the White Sea, animal life was extremely scanty, and it was only in the deep bay of Condelae that an abundanee was met with. The same condition of things was found in a por-

tion of the Polar Sea, where, in the shallow bays of the Murmanian coast, there was a comparatively poor fauna, while at a greater depth—namely, from 80 to 200 fathoms—the variety was unexpectedly large.

All the large and more highly developed forms occurred at great depths, certain echini, crabs, and sea spiders acquiring comparatively colossal dimensions. Among the latter was a species of pycnogonid which measured ten inches between the tips of the outstretched arms. In fact, it was found that the Polar Sea, along the Murmanian coast, was richer in animal life than any other part of the maritime portion of European Russia.

The close relationship of the animals of this region with those of the Atlantic Ocean is believed to be a further proof of the existence of a branch of the Gulf Stream on this coast, and thus to substantiate the views of Petermann of the great extent of this stream, as opposed to the ideas of Findlay, who denies that the Gulf Stream proper has power enough to reach the European coast or exercise any influence upon its climate, believing it to be completely destroyed near Newfoundland by the southwest polar current, and not to be traceable any farther.—17 *C*, *December*, 1870, 452.

EXPLORATIONS ABOUT NOVA ZEMBLA.

From the detailed report by Von Heuglin of his late expedition, recently published by Petermann, we learn that the north coast of Nova Zembla is erroneously laid down on the maps, especially the northeastern cape, which should be placed at a latitude of 77° 8′, and a longitude of 71° east. He was surprised to find a temperature of 41° Fahr. in the Matotshkin Strait, which cuts through Nova Zembla, and a still higher degree eastward, in the Kara Sea. The latter fact is ascribed to the temperature of the fresh-water currents streaming forth from the mouths of the Obi and Yenisei, which were met with as far out as the latitude of 75°. An abundance of the glass balls used by the Norwegians for the floats of nets, etc., was found on the northwest coast of Nova Zembla, which had undoubtedly been carried there from the Loffodens.

Dr. Petermann calls attention to the very trifling cost of this expedition of Von Heuglin compared with the impor-

tant results which it accomplished, the total expense amounting to only about $1000.—17 *C, December*, 1870, 449.

GERMAN EXPLORATIONS IN GREENLAND.

Our readers will remember that the German exploring expedition which went out in 1869 for the purpose of arctic discovery has lately returned home, the sailing vessel of the expedition having been wrecked on the east coast of Greenland, her entire crew, however, being saved. The steamer returned in good condition. Enough of the results of the expedition have been published to furnish the means of judging, to some extent, of the advantages secured, which are thought to be of great interest; not the least being the acquisition of a foothold of property in the north, possession having been taken of a previously unoccupied portion of the coast of Greenland, extending for about thirty German miles, or from latitude 75° to latitude 77°. An apology is made for the absence of any considerable amount of actual discovery, on account of the excessive rigor of the winds, this being very much greater than that experienced in the neighboring regions during the previous explorations on the part of English vessels. The portion of Greenland explored by this expedition is characterized by a very deep fiord, the head of which was not reached in a distance of over eighty miles; and it was thought to be not impossible that it extended all the way across to the water on the opposite side.

The most interesting feature of the land, however, was the occurrence of extensive meadows, starred with flowers, with butterflies and bees playing about them, and having large herds grazing near by of reindeer and musk-oxen. The lowest temperature experienced was about —58° F., this occurring on the 21st of February, 1870. The wind was found to be of extraordinary severity, Robinson's anemometer indicating a rate of velocity of sixty-seven miles in the hour, which, it was believed, would render sledging parties entirely impracticable. The auroral light, to the surprise of the beholders, who expected to see it in the west or southwest, was actually in the southeast.

Among the geological discoveries were beds of brown coal and numerous fossil remains. Deep-sea soundings were made, and collections taken from a depth of 1500 fathoms. One

important conclusion arrived at by the expedition was that small vessels were suited for polar exploration, and that it would be madness to attempt, as is proposed by the French, the use of a thousand-ton ship. Steamers, too, were believed to be the only form of vessels suited for research on the eastern coast of Greenland, any thing like reaching the coast in a sailing vessel being entirely out of the question.—3 *C, October* 8, 1870, 981.

GREENLAND A CLUSTER OF ISLANDS.

Lieutenant Payer, well known for his geological investigations in the Alps, has lately communicated some facts in regard to discoveries in Greenland by the late German expedition, of which he was a member, and in this he calls attention especially to the probability of the hypothesis that Greenland is essentially a congeries of islands similar to that west of it, and not a huge continental mass, as has been supposed by most authors. One strong evidence of this he considers to be furnished by the deep inlet discovered by the expedition, previously unrecorded on any chart, and which received the name of Emperor Francis Joseph's Fiord. This was found to extend deep into the interior of the land, continually opening into new arms, and widening in places until it was traced out for over one third of the estimated breadth of Greenland, and without any indication of coming to an end. Indeed, in a southwesterly direction it opened out into what looked like a great basin into which the fiord itself emptied. The circumstance also that the saltness of the fiords is generally greatly diminished by the fresh-water streams pouring into them when they are simply cul de sacs, and the fact that the great Greenland fiord, notwithstanding the enormous addition of fresh water, retained all its saltness, pointed to a maritime communication with the opposite side of the country.

Time was not allowed to the party to prosecute the exploration of this supposed strait; but it is believed, as stated, that it finds its opposite opening in Baffin's Bay. Another still more potent argument in favor of the assumption that Greenland is a congeries of islands, and not a continent, was found in the apparent absence of great longitudinal valleys, such as usually characterize continents, these being entirely

wanting in the northeastern part of Greenland.—3 *C*, 1870, 1245.

SCIENTIFIC NOTES FROM CAPTAIN HALL'S EXPEDITION.

Dr. Bessels, the director of the scientific corps of Captain Hall's steamer Polaris, in a letter addressed to the president of the National Academy of Sciences, dated Godhaven, August 16, states that he had already made some important observations in regard to the physics of the northern seas, such as a peculiar coloration of the water and an unexpectedly high specific gravity, the maximum of density noticed being 1.028. His experiences with his colleagues, Mr. Bryan, the astronomer, and Mr. Meyer, the meteorologist, have been very satisfactory; the former gentleman having made a number of successful azimuth observations, and the latter approving himself an excellent mathematician and an accomplished observer, and an honor to the Signal Service, from which he was detailed for duty with Captain Hall. This information may perhaps serve in some measure to relieve the apprehensions expressed by Dr. David Walker, in his *Overland Monthly* article on Captain Hall's expedition, in regard to the scientific results of the voyage.—*Letter from Dr. Bessels, August* 16, 1871.

NORTHWEST PASSAGE MADE BY A WHALE.

The daily papers have lately referred in brief terms to the recent capture of a whale in the Arctic Ocean with a harpoon imbedded in its flesh that must have been implanted in Davis's Straits. From a Honolulu paper we learn that the whale in question was taken by the ship Cornelius Howland, off Point Barrow, the northernmost cape of Alaska and of the main land of North America. The harpoon was marked "A. G.," referring, as was supposed, to the ship Ansel Gibbs, of New Bedford, which has been engaged for ten or twelve years in the whale fishery at Cumberland Inlet, in Davis's Straits. Cases have before occurred of whales being captured at Cumberland Inlet with harpoons in them that must have been inserted in the Arctic Ocean, but this is said to be the first instance authenticated in which the movement of the whale was in the opposite direction. Although geographical exploration has already proved the existence of a connection

by water between the eastern and western sides of America, these occurrences tend to furnish an interesting corroboration of the fact.—*New Bedford Mercury.*

SITUATION OF THE GESORIACUM OF THE ROMANS.

According to Professor Airy, the Gesoriacum of the historians of the Roman Empire is not the modern Boulogne-sur-Mer, as has generally been supposed. On the contrary, he thinks that Dunkirk has the best claim to identification with the place in question.—15 *A*, *November* 12, 1870, 625.

DEEP-SEA SOUNDINGS IN THE ADRIATIC.

As a result of some recent deep-sea explorations in the Adriatic, Dr. Schmid announces that at depths of from 50 to 630 fathoms he found but little trace of animal life, excepting the foraminifera, a fact which he attributes to the absence of the great natural currents, to which the variety of animal life in the depths of the Atlantic appears to be due. Of *Bathybius*, however, as Professor Huxley calls a peculiar amorphous animal matter found at great depths, an enormous quantity was brought up by every cast of the net below fifty fathoms. These are always accompanied by coccoliths, one of the constituents of the ancient chalk.—13 *A*, *August* 13, 293.

BED OF THE NORTH ATLANTIC.

Captain Sherrard Osborne, well known as an arctic explorer, has lately presented a communication to the Royal Geographical Society of London in reference to the Atlantic sea-bed. In this paper he states that the bottom of the North Atlantic is occupied by two valleys, the eastern extending from ten to thirty degrees west longitude, and traceable as far as the equator, with an extreme depth of less than 13,000 feet. The western valley reaches from the thirtieth to the fiftieth degree of west longitude; and the two are separated by a ridge in thirty degrees west longitude, along which the average depth is only 1600 fathoms, and which can be traced northward to Iceland and southward to the Azores, so that it is volcanic in character at both extremities. Its extreme breadth is somewhat less than 500 miles, and the depth of the water increases on both sides of it according to the distance from the axis.

From Captain Osborne's researches in regard to deep-sea beds generally, he is inclined to believe that there are no rough ridges, abrupt chasms, nor bare rock, and that the sea bottom at great depths is not affected by currents or streams, even by those of the magnitude of the Gulf Stream, and that it rather resembles the American prairies in general appearance, and is every where covered by a kind of mud.—12 *A*, *December* 15, 133.

ANTIQUITIES OF THE BLACK SEA.

The region bordering upon the Black Sea has long been known to be full of antiquarian treasures of the highest interest, as evinced by the superb reports published from time to time at the expense of the Russian government. A late exploration of the peninsula of Toman, situated between the Black Sea and the Sea of Azov, in continuation of previous researches, has brought to light many striking objects, particularly of those belonging to a past period of Greek art, and consisting of gold ornaments, sarcophagi, terra-cotta statuettes, etc.—13 *A*, *January* 15, 1871, 91.

EXPEDITION OF THE PORCUPINE.

Mr. Gwyn Jeffries, in a communication to the British Association relative to the deep-sea exploring expedition of the Porcupine in the Bay of Biscay and along the Atlantic coast of Spain and Portugal in the year 1869, stated that at depths of about a thousand fathoms many species of mollusca were found in a living state, some of which had been previously regarded as fossil and extinct, and all of them occurring in the newer tertiaries of Sicily and Calabria, and he thought that a record of the fact might lead to the further discovery of the geological phenomena which had caused the fossilization of so many species in that limited area. Some of them inhabit northern, and even arctic seas. The author suggests whether, in view of the wide distribution of many of the species of the deep-sea forms of European mollusca, they did not originate in the north, and spread southward in consequence of the great arctic current. He also inquires whether, since the pliocene division of the tertiary formation is found to contain scarcely any extinct species, and, in fact, the percentage being likely to be reduced to nothing by further explor-

ers, that artificial division should not disappear entirely, and be merged in the quaternary, and the tertiaries be restricted to the eocene, miocene, and oligocene.

In the course of a subsequent communication, Mr. Jeffries described a living *Pentacrinus* obtained on the same cruise. The base of this was free, although imbedded in the mud. The animal is interesting, as being the first and only instance of a European species of this genus, which forms so important a link in the geological chain, and connects the mezoraic period with the present epoch.

EXPLORATIONS OF THE POMMERANIA IN THE BALTIC.

The German surveying ship Pommerania returned from her cruise in the Baltic in August last, having been occupied during the summer in making soundings of the sea bottom, in dredging, and in noting the temperature of the water at different depths. The greatest depth between Gothland and Windau was found to be 720 feet, being less than previously estimated. At a depth of from 600 to 720 feet, at the latter end of July, the temperature was only 33° to 36.5° Fahrenheit. No marine plants were met with in this cold area, and only a few annelids were dredged up. Life was very abundant to the depth of about 300 feet, while plants were seldom found at a depth of more than 30 feet.—12 *A*, *September* 21, 1871, 417.

EXPLORATIONS OF GRANDIDIER IN MADAGASCAR.

Few geographical researches of modern times have been more interesting than those carried on in Madagascar by M. A. Grandidier, whether we consider our previous ignorance of the region in question or the number of striking and important scientific novelties brought to light. We have already referred to the return of this gentleman from his third expedition, the first having been commenced in 1865. On this occasion he attempted to reach the heart of the island, but in vain; and in the following year he explored the southern region, but did not reach the mountains. In 1869–70, however, he traversed the entire length of the island three times, from west to east, through its whole extent, making various lateral excursions to interesting points, and visiting the peak of the mountain Ankaararatre, the highest summit

in Madagascar. According to the report just presented by M. Grandidier to the Academy of Sciences of Paris, Madagascar comprises two distinct regions—the northern, which is mountainous, and that to the south and east, which is flat. He ascertained that there are five chains of mountains, which have generally the same direction—namely, from northeast to southwest. These are separated by sandy and arid plains, intersected by shallow ravines. After crossing the fourth chain a region is reached of which the general level is from 1000 to 1200 metres in height, extending to the Indian Ocean, a vast sea of mountains, with no level lands except a few small valleys used for the cultivation of rice.

The eastern coast is intersected at almost every step with rivers and torrents, and the northwestern provinces pour into the sea a large number of important rivers. On the southern and western regions, however, the case is quite different, there being distances of fifty leagues without the smallest brook. The reputation possessed by Madagascar for luxuriant vegetation and fertile soil, according to M. Grandidier, is by no means merited, its provinces being neither rich nor productive. The secondary plains are sterile, and the population is confined to the immediate banks of the water-courses. The entire mass of the granitic mountains situated to the west of the eastern slope is naked and arid, and there is no vegetation excepting here and there little bunches growing in the ravines. In the opposite direction, however, there is some degree of fertility; and there is a line of forests extending from north to south, which connect with those of the west, forming around the island a narrow girdle, including a dry and desert region in its centre.

M. Grandidier made numerous astronomical, meteorological, and magnetical observations. He also closely studied the ethnology of the inhabitants, having taken a great many measurements upon the living body, and having collected notes of the habits, language, and traditions of the people. His natural history collections embrace over fifty new species of vertebrates, together with numerous insects and plants. Large numbers of alcoholic specimens were also gathered, for the purpose of farther investigation into the anatomy and structure of the entire animal.—3 *B*, xx., *September* 14, 1871, 603.

EXPLORATIONS IN SOUTH AFRICA.

Researches in South Africa by Mr. Bayne, prosecuted for the last two or three years, are considered as adding an important chapter to the history of the interior of that continent. The survey was extended over the gold-yielding country lying between the Limpopo and Zambezi rivers, the farthest point north reached being 17° 30′ south latitude, the distance from the Zambezi at one time being only 120 miles. On this line Mr. Bayne met with the upper part of a number of streams, flowing on the one side into the Zambesi, and on the other into the Indian Ocean, the high lands forming the water-shed of this part of Africa.

SCHWEINFURTH'S DISCOVERIES IN CENTRAL AFRICA.

Several foreign journals have much to say of the recent discoveries made by Dr. Schweinfurth in Central Africa, as first published in Petermann's *Mittheilungen*. The country examined by this gentleman lies to the northwest of the great equatorial lakes, and his labors have tended to define the limits of the Nile Valley in the direction of the equator, to which he has approached more nearly than any other traveler. His letters contain very interesting accounts of adventures among the Niam-Niams, a race of very peculiar and remarkable character. After crossing the water-shed of the Nile he met with another and totally different people, distinguished by the lighter color of their skin, and their blonde and frizzled hair, as compared with the brown-colored skin and long, silky hair of the Niam-Niams. They also possess the unpleasant peculiarity of cannibalism to a greater degree than is believed to exist among any other people on the face of the globe at the present time.—13 *A, January* 15, 1871, 96.

ROCKY MOUNTAIN EXPLORATIONS.

During the summer of 1870 two important expeditions were engaged in prosecuting researches into the natural history and geology of the Rocky Mountains, and as these have now returned to the East, we have been enabled to gather some facts in regard to them which may be of interest.

An appropriation having been made by Congress for the purpose of continuing geological explorations commenced

several years ago by Dr. Hayden, under the direction of the Interior Department, a party was fitted out by him at Cheyenne, about the middle of July, which included a scientific corps of ten persons, together with nine other employés. Provided with proper authority from the War Department to obtain assistance in the way of supplies and transportation, it left the point mentioned about the 6th of August, and as the work of the previous year had been southward along the eastern flanks of the Rocky Mountains to Santa Fé, the present expedition was arranged to move northward along the same range, so as to obtain as extensive a section of the mountains as possible.

Leaving Cheyenne as stated, the party proceeded along the eastern base of the Laramie Range, by way of Chug Water Creek, Laramie Peak, North Platte, Sweet Water, and South Pass, to the Wind River Mountains; then down the Big and Little Sandy creeks to Green River, and thence to Fort Bridger. Here they remained for about twenty days, making explorations in the vicinity. From Fort Bridger they then went southward to Henry's Fork, and ascending its valley to Green River and Brown's Hole, returned up the river to the Union Pacific Railroad, and thence by way of Bridger's Pass, Medicine Bow Mountain, and Laramie Plains, and through the Laramie Hills, by way of Cheyenne Pass, back to the original point of departure, which was reached about the 1st of November. Extensive collections were made in all branches of natural history and geology, and numerous sections, photographic views, sketches, and notes taken, from which to prepare the geological history of the country. It is understood that Dr. Hayden's report is well advanced, and will probably be printed in the course of a few months.

The expedition of Professor Marsh, although a private one, and instituted especially in the interest of the museum of Yale College, was also of great magnitude, and thoroughly equipped for accomplishing its desired object. His party consisted of twelve companions, principally students or recent graduates of Yale, and left New Haven on the last of June, proceeding directly to Fort M'Pherson, on the line of the Union Pacific Railroad. From Fort M'Pherson, escorted by a company of the Fifth Cavalry, under Lieutenant Riley, an exploration was first made along the Loup Fork and Niobra-

ra, where rich collections rewarded their efforts. Returning from this excursion, they proceeded early in August to Fort D. A. Russell, near Cheyenne, and from that point made a trip, accompanied by a detachment of the Fifth Cavalry, under Captain Montgomery, into Northern Colorado, and thence to Antelope Station, where extensive collections were made. From this point they moved to the north branch of the Platte River, near Chimney Rock, and again returned to Fort Russell by way of Horse Creek. Continuing their labors, they started westward to Fort Bridger, with an escort from the Thirteenth Infantry, and examined the eastern Uintah Mountains, and the region along the Green and White rivers, and other main tributaries of the Colorado, and after an absence of about eight weeks returned to Fort Bridger.

Thence a portion of the party went to California, and visited the Yosemite Valley, while others proceeded to Denver in November, and then to Fort Wallace, in Kansas, where their explorations for the season were concluded. The amount of material brought in by both these parties, the movements of which overlapped each other to a certain extent, may be considered as the most important and valuable ever made in a single season in the United States; and as they will be submitted to the most accomplished specialists in the United States for investigation, we may look with confidence to the final reports of the results as likely to clear up a great deal that is at present perplexing and obscure in the geology and natural history of the country.

EXPLORATIONS OF PROFESSOR POWELL.

It may be remembered by some of our readers that Congress, at its last session, made an appropriation of $12,000 for completing the survey of the Colorado of the West, under Professor Powell. A proposition is now before that body for an additional appropriation of $12,000 to enable the professor to undertake and complete a topographical and geological survey of the valley of the Green River. As the equipment now on hand, and used in the surveys of the Colorado, will answer for the work on the Green River, and as this last-mentioned valley must be traversed before the labors on the Colorado can be finished, it is urged that the work can be accomplished at a much less cost than that of the original

undertaking. The appropriation is commended by the Secretary of the Interior to the favorable consideration of Congress.

The professor has returned from the West for the purpose of building boats to be used in the lateral cañons of the Colorado. He has been quite successful in finding passes into the Grand Cañon by which supplies can be taken to the river. Thus he will be able to continue his work to completion even though he should meet with a loss of rations at any time, as he did on his first trip through the cañons, for now he can get fresh supplies through these passes. After he had completed the exploration of these cañon passes he crossed Northern Arizona to New Mexico, and on the way visited the "Seven Ancient Cities," and spent several weeks with their interesting people, making vocabularies of their language, collecting their implements, utensils, etc., and studying their mythology, religion, habits, customs, etc.

The professor found that their religion was elaborately systematized, and that they used sacred paintings, or picture-writing, in their worship. His discoveries among this remnant of a once great nation will be of interest to those who have made a study of the aboriginal races of the continent.

In March or April he will rejoin his party left in the field, shipping his boats by the Pacific Railroad.

EXPLORATION OF PROFESSOR COPE.

Among the explorations of the past season in the interest of natural history, one of the most important and productive in its results was that of Professor E. D. Cope, of Philadelphia, well known for his indefatigable researches in regard to the recent and fossil vertebrates of America. The field of his labors was mainly in the valley of the Smoky Hill Fork of the Republican River, in Kansas, where, under the protection of an escort of seventy-five infantry, commanded by Captain Butler, and detailed by order of General Pope, he spent seventeen days in the diligent prosecution of his labors. As is well known to American palæontologists, this region is one of the richest in the world in fossil remains of reptiles and fishes. Of these a large number of specimens were obtained by Professor Cope, many of extraordinary magnitude, and some of them entirely new to science. More or less complete

series were obtained of the bones of animals previously known only by a few fragments, thus supplying much better information as to their affinities and position in the system. Nearly the entire skeleton of a large fish, provided with teeth of immense power, was exhumed. This animal is to bear the name of *Portheus molossus;* and its remains occurred in such abundance as to demonstrate that it must have been a characteristic and very formidable inhabitant of the cretaceous seas.

Another discovery was that of a reptilian form related to or intermediate between the tortoises and serpents. The ribs of this animal were long and attenuated, but, instead of being united in the carapace, as in the tortoise, remained separate, possibly united by membrane. If built at all on the chelonian pattern, the expanse would have been at least twenty feet. This is to be called *Protostega gigas.*

During his explorations in 1870 Professor Marsh ascertained the existence of a species of pterodactyl, or flying lizard, in the cretaceous strata of the West, and additional specimens of the same or another species were found by Professor Cope during the expedition just referred to. The most gigantic reptiles met with by him this year were species of *Liodon*, *Polycotylus*, and *Elasmosaurus.* Of these, *Liodon* was found most abundantly, and one specimen will probably prove to be the largest of all known reptiles. *Elasmosaurus* had the most massive body, and must have presented an extraordinary appearance, in consequence of the great length of its neck.

HEAD WATERS OF THE YELLOWSTONE.

For many years past the *terra incognita* of the United States has been the region forming the head waters of the Yellowstone River, to the north of the Wind River Mountains. Traditions have prevailed for a long time of the existence there of a large lake, and of boiling springs and spouting fountains, of terrific waterfalls, and other wonderful works of nature. Trappers have looked into the mysterious region from the summits of the neighboring mountains, but did not dare any nearer approach, owing to the physical obstacles and the fear of Indians. Colonel Raynolds, in his last expedition into the Upper Missouri region, in which he was ac-

companied by Dr. Hayden as geologist, aimed to reach the locality referred to, but was prevented by deep snows and other impediments. We now learn from a Montano journal that a party of bold explorers from Helena, fourteen in number, under the lead of General H. D. Washburne, have at last solved the interesting problem, having visited the country, and returned, after an absence of six weeks, with a report of their discoveries. They left on the 17th of August, and, proceeding to Fort Ellis, were there joined by an escort of five soldiers. Leaving this fort on the 22d of the month, they continued their route through Bozeman's Pass, and after a short time reached the fall of the Yellowstone. Up this stream they advanced for several days, until they arrived at the Great Fall on Cascade Creek. This was found to be upward of 350 feet in height, and of great magnificence, its swift waters flowing through a cañon in some places 2000 feet in depth.

Still farther up the river they came to a region abounding in hot sulphur and mud springs, the heated vapors steaming forth perpetually through the openings in the soil.

Leaving the falls, and proceeding up the river, they met with another remarkable series of springs and mud volcanoes. On one hill they found a large spring, filled with boiling water, gushing up in a basin formed of pure, solid brimstone. Around this were other springs of different characters, while sulphur occurred in inexhaustible abundance. A series of springs was seen in which the mud was constantly bubbling up in a kind of thick mush, one of them forming a volcano, from which the mud was ejected to a great height.

The most remarkable discovery of the party, however, was that of a valley abounding in geysers of enormous dimensions, the largest throwing a solid column of water from 150 to 250 feet in height. There were a dozen of large size, while the smaller ones were almost innumerable. As usual in these hot springs, the borders were constituted by a hardened deposit from the water of a silicious character and of great beauty, looking as if carved out by the art of the sculptor.

In the course of the expedition, a lake of steaming hot water was found 450 yards in diameter, resting in a basin which had been built up by its own overflow to a height of 50 feet. The ultimate destination of the party—namely, the Yellowstone Lake—was ascertained to be a body of water about 22

miles in length and 15 miles in width, and at a level above the sea (as shown by the barometer) of about 8000 feet.

The length of time which the party was able to spend in this region of wonders was too limited to determine whether still greater marvels might not exist in the neighborhood, and we presume it will not be long before a thorough exploration of the whole region will be made, and all its hidden curiosities brought to light.—*Helena Herald, Sept.* 29, 1871.

HEAD WATERS OF THE YELLOWSTONE AGAIN.

In the preceding article we give an account of explorations in the region about the head waters of the Yellowstone in 1870, and we have now to record the renewal of this enterprise, on a much larger scale, by Dr. Hayden, in 1871. At the head of a large party, this eminent geologist took the field early in the summer, and after examining an intermediate portion of the Rocky Mountain region, started for Yellowstone Lake by way of Fort Ellis and Botteler's Ranch.

After establishing a dépôt of supplies on the Yellowstone River, about 140 miles below the lake, the party ascended the river, and reached the lake on the 26th of July, where they made a new camp. They then began at once to survey the lake with the most approved apparatus, by the aid of a boat taken along for the purpose, and expected to be able to ascertain the exact contour as well as the principal depths. They had already found several places in the lake where the depth reached 300 feet, especially along the line of a certain channel-way, and they confidently expected to find soundings of at least 500 feet.

They explored one of the islands in the lake, which they called Stevenson's Island, and found it to contain about 1500 acres, densely wooded, and with thick and almost impenetrable underbrush, consisting largely of gooseberry and currant bushes, loaded down with ripe fruit. On the threshold only of the wonderful natural phenomena in the way of geysers, boiling springs, etc., described by Lieutenant Doane and Governor Langford, they were satisfied that the description fell far short of the reality, which they, indeed, despaired of being able to portray, even with the aid of photographic views and sketches.

One of these geysers once in 32 hours threw up a column

of water about 8 feet in diameter to a height of over 200 feet. Hundreds were met with having columns of from 10 to 50 feet high, some playing all the time, and others only at intervals. The hottest springs were found to vary in temperature from 188° to 198°; the boiling point at that altitude amounting to about 195°. Most of the springs were ascertained to be divisible into two principal classes, one class containing silica, sulphur, and iron, and the other silica and iron only.

The elevation of the lake was determined to be about 8500 feet; the altitude of the surrounding peaks being, of course, very much greater. An abundance of trout was found in the waters, of excellent flavor, although much infected with intestinal worms. Game was scarce immediately around the lake, but at a short distance it was said to be very abundant. In addition to the topographical and geological collections, others were being made in all branches of natural history, for a full account of which, as well as a description of the phenomena in general, we shall look with interest to the forthcoming report of the expedition.—*Letter.*

COMPARATIVE HEIGHT OF MOUNTAINS ON THE PACIFIC COAST.

An animated discussion is at present being carried on by the newspapers on the Pacific coast as to which state possesses the highest mountains; Mount Shasta, in California, with an altitude of 14,440 feet, as determined by Mr. Clarence King, finding it necessary, according to the Olympia papers, to yield the pre-eminence to Mount Rainier, in Washington Territory, which Professor Davidson, of the Coast Survey, decides to be 14,444 feet high, or four feet more than the other.

SUCCESSFUL ASCENT OF MOUNT WHITNEY BY MR. KING.

Some of our readers are familiar with a series of thrilling articles now in the course of publication by Mr. Clarence King, entitled "Mountaineering in the Sierra Nevada," and have doubtless sympathized with him in his efforts to determine the altitude and physical character of the loftiest peaks of the West.

The scene of his adventures is laid in that portion of the Sierra Nevada near the sources of the Kern and King rivers,

in the southern part of the state, where some hundreds of square miles have a general elevation of 8000 feet, with numerous peaks rising to a height of from 10,000 to 15,000 feet. The loftiest summit in the Sierras is that named Mount Whitney, by Mr. King, in honor of Professor J. D. Whitney, the state geologist of California, and almost the only one the summit of which was not reached in the survey of the state. Determined, however, not to be baffled by this single peak, Mr. King took the opportunity of his renewed research in the West during the present summer to make a final essay, and with triumphant success, as we learn from a late number of the San Francisco Bulletin.

On the present occasion he started for Mount Whitney from the eastern or Nevada side, by Owen's Lake, and reached the summit on the 22d of June. The details of his adventures and observations have not yet been announced, although they may soon be looked for. It is not likely, however, that the altitude will be found to be much less than 15,000 feet, and may even slightly exceed this.

RAYMOND'S REPORT ON THE YUKON.

During the summer of 1869, Captain Charles W. Raymond, United States engineers, was ordered by Major General Halleck to visit the Yukon River, with the special object of mapping out its course, and of determining the latitude and longitude of Fort Yukon, a post for many years in the occupation of the Hudson Bay Company, but which was believed to be within the new territory of Alaska. In pursuance of this order he visited that region, accompanied by Mr. John J. Major, well known as a topographer and astronomer, and spent a number of months in the work. Owing to having been detailed to other duty shortly after his return, Captain Raymond was unable to complete the report of his exploration until quite lately. This has, however, been recently sent in to Congress, and has just appeared from the press of the public printer. It consists of a general introduction, summing up the progress of discovery in Northern Alaska, which is followed by an account of the expedition, the resources of the country traversed, and a detail of the physical observations. The longitude of the fort was determined to be 145° 17′ 47″, and its latitude 66° 33′ 47″, or just over the line of the arctic

circle. Magnetic observations were made on a small scale, and in a table we find a statement of the absolute magnetic declination, the absolute inclination and horizontal intensity, and the total intensity at the fort.

WHITEAVES'S EXPLORATION OF THE ST. LAWRENCE.

Among other scientific explorations referred to in the "Scientific Intelligence," as promised during the past summer, was one about to be undertaken in the way of deep-sea dredging in the Gulf of St. Lawrence, by Mr. J. F. Whiteaves, in the interest of the Natural History Society of Montreal. We find in a late number of *Nature* a report of his labors from this gentleman, from which it seems that the investigation lasted for a period of five weeks, the first three of which were spent on the schooner *La Canadienne*, and the remaining two on the *Stella Maris.* The area examined included an entire circuit round the island of Anticosti, and extended from Point des Monts (on the north shore of the St. Lawrence) to a spot about half way between the east end of Anticosti and the Bird Rocks. As these investigations were almost necessarily subordinate to the special duties on which the schooners were engaged, in several cases the same ground was gone over twice.

The bottom, at great depths, was found to consist of a tough, clayey mud, with occasional large stones on the surface. Temperature observations do not seem to have been made with very precise instruments, but, as far as ascertained, the mud at this depth was about 37° to 38° F. In the deepest part of the river, on the south shore, the temperature was a little higher. Sand dredged on the north shore in 25 fathoms also made the mercury sink to 37° or 38°. The principal explorations were prosecuted in a depth of from 250 to 300 fathoms. The maximum sounding observed by the government surveying parties, however, west of Newfoundland, is 313 fathoms.

Numerous species of marine invertebrates were obtained, of which twenty-four species of mollusca occurred at depths of from 90 to 200 fathoms. Nearly all of these are arctic forms, and eleven of them are new to the continent of America. Three species of brachiopods were found. The close similarity of the deep-sea fauna of the Gulf of St. Lawrence

to that of the quaternary deposits of Norway was thought to be quite noticeable; but many of the characteristic North European invertebrates were not met with. This may, perhaps, have been owing to the comparatively limited extent of the investigations. It was expected that quite a resemblance would be found to exist between the recent fauna of the deeper parts of the Gulf of St. Lawrence and that of the post-pliocene deposits of Canada. This, however, was not very striking, although somewhat indicated.—12 *A*, *November* 2, 1871, 8.

EXPLORATIONS IN VINEYARD SOUND.

Professor Verrill has lately given, in the Journal of Science, an account of the researches in marine zoology prosecuted by him during the past summer at Wood's Hole, Massachusetts, in connection with investigations of Professor Baird respecting the food fishes of the coast of the United States; and in this he calls the attention of geologists to some of the more important features of these examinations, promising a fuller account hereafter. One of these results consisted in ascertaining that, while the shores and shallow waters of the bays and sounds, as far as Cape Cod, are occupied chiefly by southern forms belonging to the Virginian fauna, the deeper channels and central parts of Long Island Sound, as far as Stonington, Connecticut, are inhabited almost exclusively by northern forms, or an extension of the Acadian fauna. Both the temperature observations at the surface and the deep-sea dredgings prove that there must be an offshoot of the arctic current settling into the middle of Vineyard Sound. Quite a number of interesting ascidians, both simple and compound, were met with by Professor Verrill, several of them entirely new to science. Several new sponges were collected, and also a large number of crustaceans and mollusks previously unrecorded in that region. We would refer our readers to Professor Verrill's article in the November number of the American Journal of Science for these interesting facts.—4 *D*, *November*, 1871, 357.

EXPLORATION OF THE GREAT LAKES.

We have already referred occasionally to investigations prosecuted during the past summer, on the great lakes, into

the fauna and physical condition of the deeper waters; and we find in the last number of Silliman's Journal a more detailed account of that portion of the work carried on in Lake Superior, upon the United States steamer Search, under the direction of General Comstock, of the Lake Survey, as reported by Mr. Sidney J. Smith, the zoologist of the expedition.

The deepest water met with was 169 fathoms, the bottom being there covered, as in all the deeper portions of the lake, with a uniform deposit of clay or clay mud; and not the slightest trace of saline matter was detected in the water in any part of the lake. The temperature, every where below thirty or forty fathoms, varied very little from 39° Fahr., although, in August, it varied at the surface from 50° to 55°. The fauna at the bottom was found to correspond to these physical conditions. In the shallow waters the species vary down to thirty or forty fathoms, after which the deep-water fauna begins, and the species appear to be uniformly distributed. The list of species is meagre, and the deep-water region is characterized rather by the absence of many of the shore species than by the presence of any peculiar class. The same crustaceans and marine forms met with in 1870 in Lake Michigan were also found here abundantly, together with the same species of *Pisidium;* and some of the crustaceans have so far been undistinguishable from those found in Lake Wetter, in Sweden. The detailed account, of which that in the Journal of Science is an abstract, appears in the report of the chief engineer of the army to the Secretary of War, just presented to Congress.—4 *D*, *November*, 1871, 373.

EXPLORATIONS IN THE WEST INDIES.

In the search for new regions of exploration and discovery, it is not a little surprising to be assured that, taking the West Indies as a group, we know almost as little of their natural history as we do of that of Central Africa, especially of the islands east and south of the Greater Antilles. Thanks to the labors of Dr. Gundlach and Professor Poey in Cuba, of Dr. Bryant in the Bahamas, of Mr. March and Mr. Gosse in Jamaica, of Mr. A. E. Younglove in Hayti, of Dr. Bryant, Mr. Swift, and Mr. Latimer in Porto Rico, of Mr. Swift in St. Thomas, of Mr. Galody in Antigua, of Mr. Julien in Sombrero, and of Mr. Newton in Santa Cruz, we have a fair knowledge of

the birds of the islands mentioned; but of Anguilla, St. Martin, Barbuda, Nevis, Montserrat, and Grenada, we know nothing; and of St. Bartholomew, St. John, Saba, and Barbadoes next to nothing. Dominica, Martinique, and Guadaloupe have been more or less explored by English and French naturalists, although with no very complete result. We are glad to see that the Zoological Society of London is printing a paper by Dr. Sclater upon a collection of the birds of Santa Lucia sent to the Society by Mr. De Vœux, in which twenty-five species are enumerated, and among them three entirely peculiar to the island, one of them, a species of oriole, being hitherto undescribed. To such of our readers as have a spirit of enterprise, and are desirous of visiting a region which is sure to reward them with rich and undescribed treasures in natural history, we earnestly recommend the smaller West India Islands, to which a trip can be made, especially in the winter season, with little or no risk to life or health, and with ample promise of satisfactory results.

WILLIAMS' COLLEGE EXPEDITION, 1870–71.

We find in the American Journal of Science for July a more detailed statement of the result of the Williams' College expedition than has heretofore been published. This consisted of five members of the present senior class, under the leadership of Mr. H. M. Myers, who gained much experience in the line of exploration in connection with the Venezuelan branch of Professor Orton's expedition of some years back. We have already referred to the movements of this party, and it is only necessary to add that large numbers of birds were obtained by the expedition at Comayagua, as well as two statues, exhumed at Chorozal, south of Belize. The collections made by the party will go to enrich the Williams' College Lyceum of Natural History, and will add much to its already extensive treasures.—4 *D*, *July*, 1871, 67.

EXPLORATIONS OF DR. HABEL.

After a seven years' tour of exploration in South America, Dr. A. Habel, a former resident of Hastings-on-the-Hudson, has returned to New York, where he is assiduously engaged in preparing the results of his labors for the press. Among the regions traversed by this gentleman may be mentioned

the greater part of Central America, the Cordilleras of the Andes in Colombia, Ecuador, and Peru, and finally the Chincha Islands and the Galapagos. During this whole period Dr. Habel was diligently occupied in gathering information in regard to the natural and physical history of the countries mentioned, especially in the departments of ethnology, meteorology, and zoology. He has already made some communications on the subject of his travels to the Academy of Sciences at Paris, and other learned bodies, and we look forward to his detailed report with anticipations of much interest. The guano deposits of the Chinchas were thoroughly explored by the doctor, who found them to be of a much more complicated structure than has hitherto been supposed.

INDIAN RACES OF THE ISTHMUS OF DARIEN.

Much interest was excited in Bogota by the arrival there of a delegation of certain chiefs of the Tulé tribes of Indians of the Isthmus of Darien, for the purpose of presenting complaints to the federal authorities respecting impositions exercised to their prejudice by various foreign vessels touching at their ports, as obliging them, under threats of violence, to sell their productions at prices fixed by the buyers, collecting the vegetable growths of their forests without the consent of the owners, maltreating their families, etc. Among the parties referred to by the Indians were various members of the United States surveying expeditions. These people, it is said, are well advanced in the arts of civilization, possessing very comfortable residences, and raising a considerable variety of vegetable productions. Their capital is called Tituo, and their country is situated between the River Arquia on the east, and the Gulf of San Blas on the west, extending over about 172 miles on the coast. The total population is estimated at 7200, occupying about 1200 houses, arranged in 36 villages.—*Panama Star and Herald.*

REPORT ON THE DARIEN CANAL.

In the New York Herald we find a report of Captain Selfridge, of the Darien Surveying Expedition, addressed to the President of Colombia, which presents the same conclusions in regard to the proposed canal as those already communicated by the Herald reporter accompanying the expedition,

and published in that paper. President Salgar is informed by Captain Selfridge that the expedition, composed of two vessels of the United States navy, left New York in January, 1870, and arrived in the Bay of Caledonia in the month of February following, a vessel of the Pacific squadron having been sent to co-operate on the Pacific coast.

From the port of Caledonia and from the port of Sarsardi observations were made on two lines, which terminated on the coast of the Pacific in the confluences of the rivers Sabana and Lara. Both these, however, were found to be impracticable for a ship canal, the Cordilleras being at no point less than 1000 feet in altitude, while the breadth of the mountain rendered the construction of tunnels impossible, even if there had been enough water to furnish the necessary lockage.

The expedition then sailed for the Bay of San Blas in the latter part of April, 1870, and surveyed a route which, across the narrowest part of the isthmus, measured only twenty-six miles, from the Atlantic to the navigable river Bayamo. The results were equally unfavorable along this line, the lowest level of the Cordilleras being found to be 1134 feet, with heights of 800 feet on either side; and the construction of a canal by this route was considered even more impracticable than by those just referred to.

In consequence of the approach of the rainy season the expedition ceased its labors, and sailed for New York on the 10th of June, 1870.

The surveys were again resumed on the part of the United States in December, and reached the mouth of the Atrato River on the 30th of the same month. The explorations of 1871 were intended to embrace routes which follow certain tributaries of the Atrato, as well as a line said to have been discovered by M. De Puydt, a Frenchman, who maintained that at no point was there an elevation of more than about 250 feet. Careful exploration, however, with an exact mercurial barometer, showed an altitude of 750 feet in the valley of Tunela before reaching the Cordilleras. The expedition then directed its principal efforts to the exploration of a line beginning at the Atrato, and following the valley of the Paranchita (a tributary of the Cacarica), crossing the Cordillera of Cué, down stream, and from that point to Penogama, and thence to a navigable point. The total length proved to be

fifty-five miles, the route being generally known as that of Tuyra.

Another line was surveyed, extending from the Bay of Cupica, in the Pacific, and following the valley of the Napipi to its mouth. A third route, by way of the River Bojaya, was heard of, but too late to make any examination; and it was thought that the results of an inquiry there would not be any more satisfactory, at least, than the route by the Napipi, both rivers running very near each other.

Farther prosecution of the work during the past season was impracticable on account of the approach of the rainy season and the general exhaustion of the parties, but data enough were obtained, it is thought, to give a definite conclusion in regard to the subject of inquiry. Both the Tuyra and Napipi routes are believed by Captain Selfridge to be practicable, although a canal along the former would probably cost $140,000,000, and one along the latter $110,000,000. Neither is quite satisfactory, however, and it is a question whether any attempt will be made to realize the much-talked-of project on the Isthmus of Darien.

In the progress of the expedition a vast amount of light was thrown upon the general geography and physical character of the country, the natural history being illustrated by collections in the departments of botany and zoology. Captain Selfridge concludes his report by reminding the government of Colombia that the route by Nicaragua will be a formidable rival to any other more southern one, and that, unless very favorable conditions are offered, it is more than likely that the canal will ultimately be built through Nicaragua. —*New York Herald, September* 1, 1871.

EXPLORATION OF THE PERÈNÈ RIVER.

Within the past few years the government authorities of Peru have done a great deal toward exploring the less-known portions of that country, especially those on the eastern slope of the Andes, and the report of a late expedition has just reached us. The object of the examination in question was to determine the navigability of the River Perènè, and the character of the adjacent country. This river, which is a branch of the Ucayale, or, rather, of the Apurimac, rises near the town of Tarma, in the department of Junin, and flows

through the country of the Chuchumayo Indians, a wild and but little known tribe. According to the report of the chief of the expedition, dated October 26, the river was found to be completely unobstructed, and navigable to within a distance of only fifty-eight leagues from Lima, so that water communication with the Atlantic becomes practicable by that route in half the time now required to pass round Cape Horn. The river is one hundred yards wide, and from three to five fathoms in depth, up to a point where a convenient route across the Andes from Lima would strike it.

In the course of the expedition an Indian camp was met with, in which was a house twenty yards long, sixteen yards wide, and fifteen yards high. In this they found a sort of furnace for smelting iron, which was of a square form, about two yards high, and one and three quarter yards each way, constructed of bricks half a yard long. The fire was furnished with two double bellows, the fuel used being coal and wood, mixed with pounded ore. A considerable quantity of cast-iron was found, and a number of articles of unusual excellence of construction. None of the Indians themselves were met with.—*Panama Star and Herald, Dec.* 17, 1870.

EXPLORATION OF PROFESSOR HARTT.

Our readers have been kept advised, through the papers, of the movements of Professor Hartt's third visit to Brazil—instituted, in part, for the purpose of enriching the cabinet of Cornell University—and have been informed of its safe return on the 22d of December last. We learn that, besides making extensive collections in all departments of natural science, the exploration has brought to light several new features in regard to the geology and physical geography of the valley. The great Amazonian forest, according to Mr. Hartt, does not cover the whole district from the Andes to the Atlantic, and the mountains of Guiana on the north to the plateaus of Minas Geraes on the south, but consists of a comparatively narrow fringe overgrowing the lowlands, or flats, bordering the banks of the river and its affluents, while the intervening region is composed of grass-covered campos almost imperceptibly swelling from the alluvial intervals, dotted here and there by groups of palms—*muriti* and *carara*—presenting a singular feature in the distribution of Amazonian forests,

usually composed of numberless varieties within a limited area.

Below the falls of the Tapajoz Mr. Hartt discovered carboniferous rock, and made a collection of a large number of species of marine fossils from this formation. The most interesting physical feature of the Valley of the Amazon is the elevated range of Ereré, where the professor and his party spent nearly a month making detailed surveys. The sierra is composed of ancient rocks quite highly inclined, much disturbed, while the plains at the northern base consist of horizontal strata containing lower palæozoic fossils, trilobites, etc. The cliffs of Ereré are covered with Indian paintings, nearly all of which were carefully copied or photographed, and presented many interesting analogies to the inscriptions on the Indian pottery found at Marajo, near the mouth of the river. A special study of the *Tupi* language enabled Mr. Hartt to collect many interesting facts regarding the primitive denizens of the Amazon, their customs, habits, and peculiar method of teaching by symbolic fable.

In making a geological section of some fifty miles of the country near Santarem, they found a thick bed of recent Amazonian shells at a height of some fifty feet above the highest present level of the river, showing that in comparatively recent times the waters covered a much greater surface at a higher level.

CRUISE OF SCHOOL-SHIP MERCURY.

The Department of Public Charities and Correction in New York has just published a report of the cruise of the school-ship *Mercury* in the tropical Atlantic, in 1870–71, under the command of Captain Giraud. This vessel, like the Massachusetts school-ship, is intended to give practical training in seamanship to a class of vagabond boys, of whom no other disposition could be made; and as this was the first experiment in New York, the result was looked for with a great deal of interest. This was entirely satisfactory, as, out of a crew of 258 boys, over 100 were, in the opinion of the captain, capable, on the return of the ship, of discharging the duties of ordinary seamen. The vessel in question sailed from Hart's Island on the 20th of December, 1870, and after stopping at the Madeira and Canary Islands, arrived at Sierra

Leone on the 14th of February. Leaving on the 21st of February, the vessel proceeded in a straight line to the island of Barbadoes, a distance of about 2800 miles, and thence returned to New York.

What especially concerns us in the present instance, however, is the fact that the voyage was utilized in the interest of science by a series of deep-sea soundings and dredgings, prosecuted between Sierra Leone and Barbadoes, these ranging in depth from 500 to 3100 fathoms, and embracing in the results specimens of the sea bottom, as also temperatures at various depths. The results of the voyage in this respect have been ably discussed by Professor Henry Draper, of the New York University, and a report published by the Department of Public Charities and Corrections.

As a general conclusion, he informs us that there exists, all over the bottom of the tropical Atlantic and the Caribbean Sea, a stratum of cold water, the temperature of which is below 50° Fahr. The general observations, in Professor Draper's opinion, confirm the theory of Dr. Carpenter in regard to the existence of a general movement of the lower water of the Atlantic toward the equator, and a corresponding flow of the surface water toward the pole.

GREAT WATERFALL IN DEMERARA.

The Kaieteur Fall, in Demerara, is to be added to the list of remarkable waterfalls, as its height is asserted to be greater than that of any other known. The perpendicular descent, according to careful observation, amounts to 750 feet, with a width during the rainy season of 100 yards. The water, after passing over the edge, preserves its consistency for only a short distance in the central portion, every where else being only a sheet of fine foam or spray, in appearance very much like snow. One interesting feature connected with this fall is the fact that the cavern behind it is the home of thousands of swallows, which issue from it in the morning and return in large flocks at night. The precise species to which these swallows belong is not indicated, and it is quite possible that they are actually swifts, and, therefore, belong to a very different family.—12 *A*, *December* 8, 1870, 108.

G. GENERAL NATURAL HISTORY AND ZOOLOGY.

VERTEBRATES OF AUSTRALIA.

According to Dr. Krefft, the well-known curator of the Australian Museum at Sydney, the vertebrate fauna of Australia, recent and fossil, foots up 133 mammals, 670 birds, 150 reptiles, 42 batrachians, and 440 fishes, making a total of nearly 1500 species. Of the mammals, 110 are marsupials, and 30 are rodents. Of parrots, 60 species are enumerated, no woodpeckers, humming-birds, or trogons being met with. Reptiles are abundant, embracing one species of crocodile, which often attain a length of 30 feet. Of 80 known species of serpents only 5 are poisonous, and those not so dangerous as the common English viper, and much less so than the American rattlesnake or copper-head.—13 *A*, 1871, *July* 15, 357.

FAUNAL PECULIARITIES OF THE AZORES.

Of late years much attention has been directed by naturalists to the peculiarities of the fauna of islands, and the study of their native animals has tended to throw great light upon the question as to the length of time that must have elapsed since such islands were either lifted up from the bed of the sea or cut off from connection with the main. We have given in previous pages some notices of the fauna of Madeira and its special peculiarities, and in the recent work of Mr. Frederick Godman upon the natural history of the Azores we have a similar problem elaborated. The most striking feature, as developed by Mr. Godman's book, is the great similarity between the productions of the islands and those of Europe, although separated by an interval of a thousand miles and a channel of 15,000 feet in depth. Thus 80 to 90 per cent. of the birds, the butterflies, the beetles, and the plants are the same as the European forms, while only 1 or 2 per cent. are American. This appears anomalous at first, in view of the fact that the currents of both water and air are from the west—a fact which should produce a preponderance of western or American forms. Great Britain, and especially

Ireland, are every year visited by numbers of American birds, brought by the westerly winds, no less than 60 or 70 species having already been recorded; while, as far as we can learn, not one bird has ever been carried from Europe, in the opposite direction, to America, there being good reason to believe that the European stragglers, picked up from time to time in our country, have reached us by way of Greenland.

Mr. Godman's explanation of this anomaly is to the effect that the Azores are in the region of storms from all points of the compass, and that every year these storms bring birds from Europe, and probably carry away an occasional American straggler. The enormous preponderance of species undistinguishable from those now inhabiting the Continent, and the entire absence of native mammalia and reptiles, according to our author, are conclusive proof that the fauna and flora are not due to a former continental extension connecting the islands with Europe.

We have already referred to the peculiarity of the Madeiran beetle fauna in the existence of numerous wingless genera, and a similar condition appears to prevail in the Azores, some of these insects being undistinguishable, even as species, from their European allies, excepting in this characteristic. A single species of beetle belongs to a genus peculiar to Madagascar, and a single plant alone represents Africa in the Azores, and it is suggested that both the beetle and plant may have been carried thither by means of a floating log, brought from the regions indicated. Attention is called by Mr. Godman to the difference between the Azores and the Galapagos, where, at only half the distance from South America, the fauna is almost entirely peculiar. This is explained by the suggestion that these latter islands are in a region of calms instead of storms, and that the introductions have been, therefore, of much rarer occurrence, and, when once established in their isolation, have been more readily modified by external conditions.—13 *A*, *May* 15, 266.

BLYTH ON ZOOLOGICAL PROVINCES.

Mr. Edward Blyth, a well-known naturalist of England, has published in *Nature* a sketch of a new division of the earth into zoological regions, differing somewhat from that of Dr. Sclater and other writers upon this subject. The num-

ber of regions proposed by him is seven, the first being ealled the *Boreal Region*, divisible, first, into the portion within the arctic circle, including Greenland; second, North Ameriea; third, Central America, with the Antilles; fourth, the chain of the Andes, with Chile, Patagonia, and the archipelagos to the southward; fifth, Europe and Asia south of the aretic eircle and north of the Pyrenees and to the Western Himalayas, thus extending from the British Islands to Northern Japan; sixth, the country adjaeent to the Mediterranean, including Africa north of the Atlas, and extending eastward to Middle China and Southern Japan; seventh, Mongolia, Thibet, and Chinese Tartary.

The seeond, or the *Columbian Region*, ineluding South Ameriea minus the portions already referred to, is divided, first, into the forest countries east of the Andes; seeond, the pampas territory; third, Bolivia, Peru, Chile, and the Galapagos.

The third, or the *Ethiopian Region*, ineludes Afriea south of the Atlas and of Egypt. This is divided into the countries extending from Senegal to Nubia and Arabia, and ineluding that around the head of the Persian Gulf, ete., as well as the depression of the Dead Sea and the Valley of the Jordan; second, Negroland; third, Southern Afriea; fourth, Hindostan proper, Deeean, and the country to the northern half of Ceylon.

The fourth, or *Lemurian Region*, includes Madagasear, the Mascarene Islands, Seychelles, etc.

The fifth is the *Australian Region*, embracing the Indo-Chinese peninsula, the southern watershed of the Himalayas, Lower Bengal, the Philippine Islands, Hainan, Formosa, ete. This includes five subdivisions, whieh, perhaps, it is not neeessary to enumerate in detail.

The sixth, or *Melanesian Region*, embraees, first, Australia minus Yorke Peninsula, part of Queensland, and Tasmania; seeond, the islands of Papua, New Britain, and New Ireland, Ceram, and the Moluecas, as also Yorke Peninsula and the eastern half of Queensland, or the main land of Australia; third, the islands of Celebes, Lombok, Timor, ete.; and, fourth, the antaretic region, including Kerguelen Land.

The seventh, or *Polynesian Region*, embraces, first, New Zealand and adjaeent islands; and, seeond, Polynesia, com-

prehending the archipelagos of the Pacific, with the exception of those belonging to the *Columbian Region*.—12 *A*, *March* 30, 428.

PECULIARITIES OF NEW ZEALAND ZOOLOGY.

Dr. Sclater, the secretary of the Zoological Society of London, in a paper upon the peculiarities of the vertebrate fauna of New Zealand, remarks that these consist, first, in the absence of all mammals excepting two species of bats; second, the presence of numerous forms of birds not known elsewhere, such as the *Apteryx*, and others; third, the absence of reptiles, excepting two genera of lizards, and a third form of lizard-like animal, considered by Dr. Gunther to constitute a special order; fourth, the absence of frogs, toads, and salamanders, with the exception of one species of the first-mentioned genus; fifth, a scarcity of fresh-water fishes, which are allied partly to the Australian and partly to antarctic American forms; and, sixth, the recent presence of a peculiar family (*Dinornis*) of gigantic birds of the ostrich group, now extinct.—12 *A*, *Jan.* 5, 192.

FAUNAL PROVINCES OF THE WEST COAST OF AMERICA.

In the course of a critical comparison of the marine faunæ of the east and west coasts of America, Professor Verrill takes occasion to mark out what he considers to be the principal zoological provinces of Western America. Taken in the order of his enumeration, he commences with what he calls the *Sitchian* Province, corresponding with the Syrtensian Province of the Atlantic coast, and extending from the termination of the arctic or circumpolar fauna to the coast of Oregon. The second, or *Oregonian* Province, includes the Puget Sound coast, and that of Oregon to Cape Mendocino, and represents the Acadian fauna on the east coast of America. The third, or the *Californian* Province, reaches from Cape Mendocino to Santa Barbara, and perhaps farther southward, and apparently corresponds to the Virginian fauna on the Atlantic. The precise southern extension of this fauna is not entirely worked out, there being possibly two other provinces, the *Diegoan* and *Sonoran*, as indicated by Professor Dana, filling up the gap reaching to the *Panaman* Province. This includes the Gulf of California, and extends from Margarita

Bay, California, to Cape Blanco, Peru, and has three subdivisions or districts: the *Mexican*, covering the Gulf of California, Cape St. Lucas, and the Mexican coast to Acapulco; the *Panaman*, including the coast of Central America and the Bay of Panama; and the *Ecuadoran*, extending southward from Panama Bay to Cape Blanco, Peru. The *Galapagos* Province, according to Professor Verrill, may possibly be a district of the preceding, but additional collections are necessary to establish this point. The *Peruvian* Province, extending from Cape Blanco to Northern Chili, is apparently well marked; and the *Chilian* Province, embracing the middle coast of Chili, also has its peculiar fauna. The *Araucanian* Province extends from Valdivia to the southwestern coast of Patagonia; while the last, or the *Fuegian* Province, includes Southern California and the adjacent islands.—*Trans. Conn. Acad.*, 1871.

HAUGHTON ON ANIMAL MECHANICS.

Professor Haughton, of Dublin, announces for immediate publication his long-expected work on animal mechanics. The author is well known as a comparative anatomist as well as an excellent mathematician, two qualifications necessary for the successful treatment of the subject. The *Athenæum* is of the opinion that there has been no writer on animal mechanics since the time of Barrelli, in the seventeenth century, so competent to discuss the subject as Dr. Haughton; the brothers Weber, of Giessen, who have also written on the subject, one of them an anatomist and the other a mathematician, scarcely meeting the requirements in the case.—15 *A*, 1870, *October* 15, 504.

HAECKEL ON ABIOGENESIS.

Of all the disciples of the idea of the mechanical theory of life, or of spontaneous generation, as connected, more or less, with the Darwinian doctrine of evolution, one of the most potent is Professor Ernst Haeckel, of Jena; and his writings in defense of the idea of abiogenesis are attracting much attention. In a recent critical notice of his later publications in *Nature* we find a statement of his views in this respect which may be summed up, in his own words, in the following striking, even if sometimes enigmatical, sentences:

"1. The forms of organisms, and of their organs, result entirely from life, and simply from the interaction of two physiological functions, heredity and adaptation.

"2. Heredity is a part of the reproduction; adaptation, on the other hand, a part of the maintenance of the organism. These two physiological functions depend, as do all forms of vital activity, on the character of the physiological organ through which they come into play.

"3. The physiological organs of the organism are either simple plastids (cytods or cells), or they are parts of plastids (*e. g.*, nuclei of cells, cilia of protoplasm), or they are built up of numerous plastids (the majority of organs).

"In all these cases the forms and actions of the organs are to be traced back to the forms and actions of the individual plastids.

"4. Plastids are either simple cytods (structureless bits of protoplasm without nuclei) or cells; but since these last have originally arisen from cytods by a differentiation of the inner 'nucleus' and the outer 'protoplasm,' the forms and vital properties of all plastids can be traced back to the simplest cytods as their starting-point.

"5. The simplest cytods, from which all other plastids (cytods and cells) originally have arisen by heredity and adaptation, consist essentially and absolutely of nothing more than a bit of structureless protoplasm—an albuminoid, nitrogenous carbon compound; all other components of plastids have been originally formed secondarily from protoplasm (plasma products).

"6. The simplest independent organisms which we know, and which, moreover, can be conceived, the monera, consist, in fact, while living, of nothing else but the simplest cytod, a structureless bit of protoplasm; and since they exhibit all forms of vital activity (nutrition, reproduction, irritability, movement), these vital activities are here clearly bound on to structureless protoplasm.

"7. Protoplasm, or germinal matter (*Bildungsstoff*), also called cell substance or primitive slime (*Urschleim*), is therefore the single material basis (*materielle Grundlage*) to which, without exception and absolutely, all so-called 'vital phenomena' are radically bound. If the latter are regarded as the result of a peculiar vital force independent of the proto-

plasm, then necessarily also must the physical and chemical properties of every inorganic natural body be regarded as the result of a peculiar force not bound up with its substance.

"8. The protoplasm of all plastids is, like all other albuminoid or protein bodies, composed of four inseparable elements—carbon, oxygen, hydrogen, and nitrogen, to which often, though not always, a fifth element—namely, sulphur—is added.

"9. The forms and vital properties of protoplasm are conditioned by the peculiar manner in which carbon has combined itself so as to form a highly developed compound with the three or four other elements named. Compounds devoid of carbon never exhibit those peculiar chemical and physical properties which exclusively belong to only a part of the compounds of carbon (the so-called 'organic compounds'); on this account modern chemistry has replaced the term 'organic compounds' by the more significant term 'carbon compounds.'

"10. Carbon, then, is that element, that indivisible fundamental substance which, in virtue of its peculiar physical and chemical properties, stamps the various carbon compounds with their peculiar organic character; and in chief fashions this protoplasm, the 'matter of life' (*Lebensstoff*), so that it becomes the material basis of all vital phenomena.

"11. The peculiar properties which protoplasm and the other component tissues and substances of the organism derived secondarily from it exhibit, especially their viscid condition and aggregation, their continual change of matter (on the one hand their facile decomposition, on the other their facile power of assimilation), and their other 'vital properties,' are therefore simply and entirely brought about by the peculiar and complex manner in which carbon under certain conditions can combine with the other elements.

"12. The entire properties of the organism are therefore ultimately conditioned with equal necessity by the physical and chemical properties of carbon, as are the entire properties of every salt and every inorganic compound conditioned by the physical and chemical properties of its component elements."—12 *A*, 1871, *March* 2, 348.

DARWIN ON THE "DESCENT OF MAN."

Few scientific works have excited more attention than that of Mr. Charles Darwin upon "The Descent of Man, and Selection in Relation to Sexes," the only parallel perhaps being found in some previous works by the same author. This treatise has already been discussed from almost every point of view, and for a considerable time it was almost impossible to take up a periodical at all interested in such subjects without finding one or more notices of the book. Among the best written of these criticisms may be cited one in *The Academy*, from the pen of Mr. Alfred R. Wallace, himself a naturalist of a high degree of eminence, and, although known to agree with Mr. Darwin in some of his views, yet entirely opposed to him in others.

As summed up in this article, the first chapter of Mr. Darwin's book discusses the evidence for the descent of man from some lower form, in which it is shown that man's entire structure is comparable, bone by bone, and muscle by muscle, with that of other vertebrata, while the close relationship is shown in many other ways, such, for instance, as his ability to receive certain animal diseases—as glanders and hydrophobia; his having internal and external parasites of the same families and genera as those of the lower animals; and in exhibiting an embryonic development so exactly similar to that of other vertebrates that his embryo can scarcely be distinguished. Much stress is laid upon the occurrence in man of rudiments of structures characteristic of lower forms, many muscles regularly present in the apes and other mammals appearing occasionally in man, although sometimes inappreciable or wanting. When the mental powers of the lower animals are compared with those of man they are found to exhibit a strong resemblance, although more or less rudimentary; and in reference to the origin of the moral sense, Mr. Darwin maintains that this arises from the social instincts combined with an active intellect.

The manner of the development of man from some lower form is next very fully discussed, attention being called to the extreme variability of every part of his bodily structure and mental faculties, the influence of changed conditions, and the occurrence of arrested developments, reversions, and va-

riations, just as in the lower animals. Although natural selection must have acted upon man as upon the lower animals, yet Mr. Darwin and Mr. Wallace agree in the view that, as soon as man's mind had become moderately developed, the action of natural selection would become changed as regards the general structure, and transferred to the mental faculties. This advance from animal to man, it is thought, must have taken place before the dispersal of the race over the world.

The author next discusses the special affinities of man to the lower animals, by which the line of the genealogy can be traced, and the time and place of his origin, together with the nature and the probable origin of the several races of man. The consideration of this latter subject necessitates the consideration of sexual selection. The theory presented by Mr. Darwin depends upon the almost invariable occurrence of a struggle among males for the females—a struggle carried on by actual fighting, or by rivalry in voice or in beauty. This produces two sets of modifications in male animals: first, weapons of various kinds have been developed, owing to those best able to fight having most frequently left progeny to inherit their superiority; and musical organs, bright colors, or ornamental appendages, in consequence of the females preferring males so gifted or adorned. This subject is treated of at great length, about five hundred pages of the original edition being occupied by its consideration.

The sexual differences in man are stated by Mr. Darwin to be greater than in most species of monkeys, while in their general features and mode of development man agrees remarkably with those animals—one of these consisting in the fact that whenever the beard differs in color from the hair on the head, it is always lighter both in man and monkeys. The law of battle for wives still prevails among some savages, just as it does among wild animals; and the admiration of certain types of form and complexion, as involving the selection of wives and husbands, is considered to have been an important agent in determining both the races and the sexual differences of mankind. In the final summary of the whole argument, contained in the last chapter, Mr. Darwin maintains that the whole evidence leads to the conclusion that man, whatever his present character, mental and physical, bears still in his bodily frame the stamp of a lowly origin.

Most naturalists, from the times of Blumenbach and Cuvier, in a systematic arrangement of the animal kingdom, have considered man as either a type of a distinct suborder, class, or even of a higher rank. Professor Huxley, however, and other prominent men of science who have devoted special attention to the critical comparison of the structure of man and the apes, have insisted that as man, in all parts of his organization, differs less from the higher apes than these do from the lower members of the same group, there is no justification for placing him in a distinct order. In this view Mr. Darwin agrees, but thinks that he may perhaps be entitled to form a distinct suborder, or, at any rate, a family. Professor Huxley divides the primates into three suborders, namely, the *Anthropodæ*, with man alone; the *Simiadæ*, including monkeys of all kinds; and the *Lemuridæ*, or lemurs, with their variations and related forms; and Mr. Darwin thinks that, so far as differences in certain important points of structure are concerned, man may rightly claim the rank of a suborder, but that, if we look to his mental faculties alone, this rank is too low. Again, on the other hand, in a genealogical point of view, even subordinal rank is too high, and man ought to form merely a family, or possibly only a subfamily. Putting his creed into the plainest terms—namely, that man is a lineal descendant of some form of ape—and referring to the great differences between the apes of the Old and New World, Mr. Darwin proceeds to inquire to which of the two man's ancestry belongs. He finds that in the essentials of the characteristics of the nose and of the premolar teeth the relation is especially with the Old-World species, and that, consequently, man must be considered as an offshoot from the Old-World monkey-stem. It is not, however, to be inferred, according to our author, that man was identical with, or even closely related to, any existing ape or monkey, but that he diverged at an early period from the common stock, and that both divisions have probably been more or less modified in the descent, so as to differ greatly from their ancestors.

Since man belongs to the Old-World division of the anthropoid animals, his origin must have been, as already stated, in the Old World, probably in Africa, for reasons adduced by our author. The country inhabited by him was probably

hot, consequently involving the loss of his hairy covering, and he is supposed to have lived upon fruits. The period of divergence of man from the monkey stock is thought by Mr. Darwin to have been as remote as that of the eocene; and at a time still more recent he supposes him to have been covered with hair, both sexes to have had beards, ears pointed and capable of movement, and tails having the proper muscles. The foot is supposed to have been prehensile at that time, judging from the position of the great toe in the fetus, and resting-places were probably occupied by him in trees, like those of many apes of the present day. The males are supposed by him to have been provided with great canine teeth, serving as formidable weapons.

After presenting a summary of Mr. Darwin's views, as understood by Mr. Wallace in the article referred to, the latter writer proceeds to take exceptions to some points enumerated, as derived from his own extended observations in the line of scientific research, but finally concludes his notice by conceding that Mr. Darwin has all but demonstrated the origin of man by descent from some inferior form, that he has proved the vast importance of sexual influences in modifying the characters of the more highly organized animals, and that he has thrown fresh light upon the mode of development of the moral and intellectual nature of man.

In giving the views of Mr. Darwin as condensed by Mr. Wallace, we of course are not to be considered as indorsing them as having been accepted by the scientific world. The work itself, in its immense array of facts, or, at least, of statements, and in the logical precision with which they are arrayed and brought up, either to form a hypothesis or sustain it, is a store-house of information and a masterpiece of reasoning; and though the general inferences may not be accepted and adopted, there is no doubt that it will exercise a very powerful influence upon the science of the day. It may be stated, however, that the doctrine of evolution, which forms so important a feature in Mr. Darwin's views, apart from that of natural selection, is accepted to a very great extent by a large proportion of the leading naturalists of the day, and that their number is constantly increasing.—13 *A*, 1871, 177.

MR. WILLIAM THOMPSON ON DARWINIANISM.

Mr. William Thompson, in his address before the British Association at Edinburgh, takes occasion to give in his adhesion to the Darwinian views of evolution, and not only expresses his belief that all the higher organisms now covering the face of the earth have most probably developed themselves from lower ones, but suggests also that these were most likely derived from meteoric stones and other matter fallen from the planets.—13 *A*, 1871, *August* 15, 402.

CANNIBALISM IN EUROPE.

In spite of the opposition manifested by many persons to the idea, it appears to be now well established that the earliest inhabitants of Europe were cannibals; and it is said that it was a matter of religious observance with the ancient Irish to eat their parents.—15 *A*, 1870, *April* 9, 489.

SPONTANEOUS GENERATION.

Among the more recent investigations especially interesting in a scientific point of view were those upon spontaneous generation as conducted by Dr. Bastian. It is well known that Professor Huxley, in his address delivered before the British Association in 1870, made special reference to these inquiries, and came to the conclusion that the data upon which Dr. Bastian based his conclusions were incorrect, and that the existence of any thing like spontaneous generation, if not finally disproved, at least required stronger arguments than had been presented for its acceptance as a law.

Subsequently to this, Dr. Frankland, who has made many experiments for Dr. Bastian, announced in *Nature* that he had lately re-examined the entire subject with more critical precautions than had hitherto been taken, and that he found nothing whatever to show the occurrence of spontaneous generation. It is true that various movements of atoms were observed, as stated by Dr. Bastian, but this movement was found to be a mere Brownian motion, many of the particles being minute splinters of glass, and without the slightest evidence of life in any of them. This observation of Dr. Frankland would seem to settle the question for the present, and render it necessary for the advocates of spontaneous genera-

tion to bring forward further arguments, although Dr. Bastian does not appear at all satisfied with the reasoning of Dr. Frankland, to judge from the rejoinder he has published in *Nature* for January 26.—12 *A*, 1871, *Jan.* 29, 225.

THEORY OF ATMOSPHERIC GERMS.

In a paper on the "Theory of Atmospheric Germs," by Dr. Sansom, published in the April number of the *Quarterly Journal of Science*, after a critical examination and testing of the various views held by different writers on this question, the author comes to the following conclusions: "1. Putrefaction, mildew formation, and the appearance of organisms can be checked or absolutely prevented by the existence of certain agents in the air supplied to a putrescible body. 2. The power of such agents can in no sense be measured by their chemical constitution and characters. From many experiments, the following expresses their order of efficiency from weakest to strongest: (1), chloride of lime; (2), sulphurous acid, ammonia, sulphuric ether; (3), chloroform; (4), camphor; (5), iodine, phosphorus, creosote, carbolic acid. 3. The agents which stop fermentation are vegetable, not animal poisons. Fungi will grow in the presence of hydrocyanic acid and of strychnia. 4. Comparative experiments show that a given volatile agent is far more efficient when it is contained in the air supplied to a putrescible solution than when an equal quantity is mixed with the solution itself. 5. All fungoid organisms can be prevented by the presence of a minute proportion of creosote, carbolic acid, ammonia, hydrochloric acid, or sulphurous acid in the air, though beneath the surface of the fluid are found numerous bacteria and vibrios. There seems to be no escape from the conclusion that the germs of fungi exist in the air, and are destroyed by the volatile poisonous agent."—16 *A*, 1871, 169.

ATMOSPHERIC GERMS.

During a lecture by Professor Tyndall upon dust and smoke, he took occasion to make renewed reference to the influence of atmospheric action upon putrefaction and decomposition, and reiterated his belief that contagious disease is generally of a parasitic nature, and is propagated by spores floating through the atmosphere as positively, to all intents and pur-

poses, as a crop of wheat is raised from its seed. He dwelt upon experiments by Recklingshauser in regard to the development of blood, and stated that he had himself seen in the laboratory of that gentleman blood which had been three weeks, four weeks, and five weeks out of the body preserved in little porcelain cups under glass shades, and which was then living and growing, the amœba-like movements of the white corpuscles being present, with abundant evidence of growth and development; also a frog's heart still pulsating which had been removed from the body more than a week. This was attributed to the entire absence of putrefactive germs, the instruments employed having been raised to a red heat just before use, and the suspending threads of silver wire being similarly heated. It is also stated that the remedial effect of bandages, plasters, etc., upon wounds and sores is in large part dependent upon the exclusion of atmospheric germs by their application, and that it is now considered one of the cardinal principles in surgery to protect, as far as possible, any injured surface from the entrance of such germs.—12 *A*, 1871, *June* 15, 124.

CALVERT ON SPONTANEOUS GENERATION.

Mr. Crace Calvert, well known for his researches upon protoplasmic life in its different conditions, has recently instituted a series of inquiries as to whether the germs existing or produced in a liquid in a state of fermentation or of putrefaction could be conveyed to a liquid susceptible of entering into these states, and has presented the first results of his inquiries to the Royal Society of London. In the course of his experiments he was astonished to find how rapid the development of germ life may be under certain circumstances. Thus, if the white of a new-laid egg be mixed with water (free from life), and exposed to the atmosphere for only fifteen minutes in the month of August or September, it will show life in abundance. For this reason he was misled in many of his earlier experiments in not being sufficiently careful to avoid even momentary exposure to the atmosphere. To the want of a knowledge of this fact he ascribes all the erroneous conclusions arrived at by several persons who have devoted their attention to the subject of spontaneous generation. Referring to the paper itself for details, we may say that a positive

conclusion against the truth of the theory of spontaneous generation was reached by Mr. Calvert, ranging him thus on the side of Professor Huxley, Professor Tyndall, and others, as against Dr. Bastian and his confrères. One of his experiments tended to show that although oxygen appears to favor the development of germs, it does not appear to favor their reproduction, and that the increase of life in an albumen solution is not due to reproduction merely, but to the introduction of fresh germs from the atmosphere.—1 *A*, *July* 14, 13.

HEREDITARY DEFORMITIES.

Dr. Wetherill furnishes to *Nature* an interesting contribution on the subject of hereditary deformities. In referring to the former practice of the squaws of the Sioux Indians, in having small disks, from one eighth to one fourth of an inch in diameter, tattooed upon the prominences of their cheekbones, he states that, during a visit, some years ago, to the country inhabited by these people, he was informed by a physician of the tribes that sometimes a child was born with these marks, and the statement was confirmed by the Indian agent. We regret that the doctor was unable, as he states, to verify the occurrence by personal observation, as, if true, it would be a fact of extreme interest.—12 *A*, 1870, *Dec.* 29, 168.

NO DISTINCTION BETWEEN ANIMALS AND PLANTS.

In a lecture before the University of Edinburgh, by Professor Wyville Thomson, the distinguished author took occasion to say that while the distinction between inorganic bodies and organized beings instinct with life appears clear, it is impossible to draw a definite line between the animal and the vegetable kingdoms. In the course of his inquiries he discusses the fourth kingdom of Ernest Haeckel, the Monera, the cells of which differ from others by the absence of a nucleus, and the total want of differentiation of any parts, and concludes that not only there is no satisfactory basis for such a fourth kingdom, but that we must take organic nature as a whole, that the animal and vegetable kingdoms are absolutely continuous, and that a tree is scarcely distinguishable from a gigantic nummulite, only building a cellulose instead of a calcareous shell, and developing a special secretion in special organs for the purpose of enabling it to do so.—12 *A*, *June* 1, 92.

RATIO OF THE SPINAL MARROW TO THE BRAIN.

Professor Mantegazza, in the *Italian Journal of Anthropology and Ethnology*, proposes a new expression of the relation between the different races of man and animals, based on the comparison of the area of the occipital foramen and the total internal capacity of the skull, or the ratio of the spinal marrow to the brain, which he calls the cephalo-spinal index. This index he considers to be less variable than the so-called cephalic index, or the relation between the longitudinal and transverse diameters of the cranium.—13 *A*, 1871, *June* 1, 288.

ORIGIN OF CIVILIZATION.

Sir John Lubbock, in his work on "The Origin of Civilization, and the Primitive Condition of Man," comes to the following conclusions from his extensive researches: First, that existing savages are not the descendants of civilized ancestors; second, "that the primitive condition of man was one of utter barbarism;" third, "that from this condition several races have raised themselves." His inference, therefore, is that the history of the human race has, on the whole, been one of progress. He does not mean to say that every race is necessarily advancing. On the contrary, most of the lower ones are almost stationary, and there are no doubt cases in which nations have fallen back; but it seems an almost invariable rule that such races are dying out, while those that are stationary in condition are stationary in numbers also. On the other hand, improving nations increase in numbers, so that they always encroach on those less progressive.—16 *A*, 1871, *October*, 508.

SUBSTITUTION OF STRONTIAN, ETC., FOR LIME IN BONE.

According to some investigations of M. Papillon, presented to the Academy of Sciences in Paris, it has been ascertained that a certain percentage of strontian, magnesia, or alumina may be substituted for the lime normally present in bone, without affecting essentially its condition. The experiments were tried upon pigeons and other animals, by supplying them with water mixed with the different salts of potash and soda, and with grain incrusted by a fine paste of one or other

of the ingredients in question. While no particular influence seemed to be exercised upon the animal by this novel regimen, on its being killed and the bones subjected to a chemical examination, the particular substance experimented with was found to enter in very considerable quantity into the ash.—6 *B*, *August* 16, 373.

PERMANENCE OF BONE.

Karl Aeby discusses the cause of the permanence of the organic substance of bone, and comes to the conclusion that its resistance to putrefaction is a consequence of the small quantity of water it contains, which, besides, is in chemical combination, fresh bones having about eleven or twelve per cent. of water and twenty-eight of organic matter. As a proof that the water is combined chemically, Mr. Aeby mentions that thoroughly dried and finely pulverized bones, when moistened, become considerably heated (one gram of bone evolving about twelve units of heat). This chemically combined water seems to act the part of water of crystallization, and can not induce putrefaction, while the rigidity of the inorganic substance prevents swelling—*i. e.*, the reception of more water from the outside. Crushed and finely pulverized bones, on the contrary, swell by soaking, and then speedily putrefy.—18 *C*, 1871, XVII., 266.

DESTRUCTIBILITY OF HUMAN BONES.

Mr. Pengelly, in the *Quarterly Journal of Science*, in reply to a question which has often been asked as to the reason why we do not find the bones of the men who made the unpolished flint implements as well as the implements themselves—a doubt thereby being thrown upon the human origin of these articles—takes occasion to show, by a careful collation of the evidence on the subject, that human bones have been found in repeated instances by reliable observers in England, France, Belgium, and elsewhere; and furthermore, that even if nothing of this sort were discoverable, human agency in the production of these implements is as distinctly shown as the print of a naked foot proved to Robinson Crusoe the presence of a second human being on his desert island. He also shows that there is a great difference in the bones of different animals as to the length of time their remains are

preserved, and that in all probability human bones are much less permanent in their structure than those of many other animals. He cites experiments by Dr. Lindley, in which one hundred and seventy-seven specimens of plants, belonging to different natural orders, including those which are constantly present as fossils in the coal measures, and those also which are universally absent, were placed in water in a tank and left for two years untouched—water being simply poured in to replace that which was wasted by evaporation. At the end of that time it was found that certain kinds had entirely disappeared, while others had left some more or less recognizable traces; and again others, especially fungi, ferns, and coniferous trees, precisely those which are generally found fossilized, were comparatively well preserved.

He also remarks, in regard to the mollusca, that certain shells, like oysters and limpets, are found more frequently than others, such as cockles, this seeming to be a curious fact, the material of both being the same, namely, carbonate of lime and animal matter. It has, however, been shown that, under certain conditions, the carbonate of lime in limpets and oysters assumed the form of *calcite*, while in cockle-shells and their allies it took the form of *arragonite*, the molecules of the latter form being in much less stable equilibrium than those of the former, and consequently much more liable to disappear under unfavorable circumstances.

As an instance, showing the readiness with which human bones disappear, Mr. Pengelly cites the fact that the Dutch government in 1853 drained off the Haarlem Lake, on which there had been many shipwrecks and naval fights, and where thousands had found a watery grave. The canals and trenches dug to a considerable depth through the rescued land must have had an aggregate length of thousands of miles, and yet not a single human bone was exhumed from first to last. Some weapons and a few coins, and one or two wrecked vessels, alone rewarded the antiquaries who watched the operations with the hope of a rich harvest. Here, as in cavern deposits and river gravels generally, works of art alone furnished evidence of the existence of man, even though no part of the deposit could be more than three hundred years old, as the lake was formed by an inundation toward the end of the sixteenth century.—16 *A*, *July*, 1871, 327.

COMPOSITION OF THE BONES IN PARALYTICS.

During an investigation of the composition of the rib-bones of general paralytics by Mr. Brown, the conclusion was reached that the ratio of organic constituents to earthy matter is much greater, and the ratio of lime to phosphoric acid distinctly less, in them than in the ribs of healthy adults, these being the same differences that exist between the composition of adult large bones and those of the fetus. Whether this peculiarity in the ribs of paralytics is due to arrest of development or to a degeneration of the fully developed bone the author does not feel able to decide at present, but he is under the impression that both causes will be found to operate. The result of the experiments he considers rather as suggestive than conclusive, it being unsafe to generalize from so few examples. He therefore advises farther research on the subject, with the hope of arriving at some definite and final conclusion.

INFLUENCE OF CLIMATE ON ANIMAL ECONOMY.

In the proceedings of the Royal Society of London will be found a paper by Dr. Rattray upon some of the more important physiological changes induced in the human economy by a change of climate, as from temperate to tropical and the reverse, the inquiries being directed toward the peculiarities of respiration, the pulse, temperature of the body, kidneys and skin, and weight and strength. In regard to the subject of respiration, the author shows, as the result of many experiments, that in the tropics there is an increase in the capacity of the chest for air, with a decrease of the number of respirations, from which it results that the lungs, unaltered in size, contain less blood and more air in tropical than in temperate climates, the blood being in part diverted to the excited skin and liver. The benefit derived in the early stage of consumption by a sojourn in a tropical climate he explains in the following manner: "Residence in a warm atmosphere is followed by a decrease in the quantity of blood in the affected lungs, by diminished activity in the vital processes carried on therein, by facilitated respiration, and, above all, by diminished lung-work from vicarious action of the physiologically excited skin and liver; while the inhalations of milder,

more equable, and less irritant air diminish the chances of excitement and increase of distressing local inflammation, and those bronchial attacks so apt to break up old, and cause the deposition of new tubercles. Now if we can imitate nature's operations, and, by increasing the temperature of a sick-room or ward in the temperate climate of England, can convert it into a local subtropical or tropical climate, we withdraw no inconsiderable amount of blood from the lungs to the skin and liver, thus relieving its overloaded capillaries, permitting freer access of air, and so aiding the respiratory process—a safe and sure mode, both of relieving dyspnœa and cough, and aiding the vis medicatrix."

This law, according to the author, is suggestive in relation to the nature of food and to hygiene in the tropics. He calculates that, in a tropical climate, the lungs eliminate less carbon to the extent of above an ounce in the twenty-four hours than in England. Hence he infers that in hot countries the diet should be less carbonaceous than at home, and that, independently of the diet, especial attention should be paid to the condition of the skin.—20 *A*, *May* 27, 613.

RATTRAY ON CHANGE OF CLIMATE.

We have already noticed an essay by Dr. Rattray upon the effect of change of climate upon the human economy, and in a concluding article of his series we find some remarks upon the influence of warm latitudes upon the weight and strength. Repeated observations have shown a decided reduction in the weight, the cause of this being threefold: first, a diminished necessity for surplus fat, which becomes absorbed; secondly, that peculiar effect of heat which causes the tissues to decay faster in a warm climate than in a cold one; and, thirdly, diminished lung-work and blood oxygenation, and thereby an imperfect renewal of the tissue. As the general conclusions from the entire investigation conducted by Dr. Rattray, we have the following summary: 1st. That the tropics, especially during the rainy season, should be avoided by natives of colder latitudes; 2d. That the young, the debilitated, and the diseased should especially shun warm regions; 3d. That none but full-grown, healthy adults should go there; 4th. That with all, even the latter, a speedy exit should be made therefrom when great loss of flesh and strength gives warning of

approaching disease; 5th. That such injurious agencies as may increase the weakening and disease-inducing influences of tropical climates, of themselves irremediable, should be avoided—*e.g.*, faulty diet, overfatigue, impure air, etc.; 6th. That to preserve health, a tropical climate should be frequently changed for the more temperate ones of higher altitudes or latitudes.—20 *A, July* 1, 18.

EFFECTS OF ALCOHOL.

The effects of alcohol have recently been tested in London by experiments upon a healthy soldier. The course of treatment was as follows: For the first six days no alcohol was given; for the next six days from one to eight ounces of alcohol were given in divided doses; for the next six days water alone; and then for three days twelve ounces of brandy, containing 48 per cent. of alcohol. The results are reported to be as follows: No appreciable difference was perceived in the weight during the course of the experiments, but the temperature of the body was slightly raised. The pulse was materially affected, rising from 77.5 beats per minute before taking the alcohol to 94.7 after the largest doses.

Estimating the normal daily work of the ventricles of the heart as equivalent to the lifting of 122 tons a foot, it was found that during the alcoholic period the heart was compelled to lift an excess of 15.8 tons, and during the last two days, of 24 tons. The conclusion arrived at was, that alcohol is utterly useless in health, and positively injurious in larger quantities than two ounces daily. There, however, seemed to be indicated an advantage in its use if employed in rousing a feeble appetite or exciting a feeble heart.—1 *A, June* 3, 253.

EFFECT OF A CONTINUED BREAD DIET ON MEN AND DOGS.

According to experiments of Meyer, neither man nor dogs can be fed economically upon bread alone, an immense quantity of this substance being required to prevent the body from undergoing waste. By the addition of a small percentage of flesh, a much less amount of total weight of food will answer the desired object. A persistence in the bread diet causes the tissues of the body to become more watery, and the entire organization is less capable of resisting injurious

influences. In experimenting upon different kinds of bread, Meyer found that white wheat bread was taken up in the greatest amount during its passage through the alimentary canal; next to this, leavened rye bread; then the rye prepared by the Horsford process; and, finally, the North German black bread. With all these differences, however, the first kind is said to be less satisfying to the feeling of hunger than the other three, and to be more expensive in every point of view. Meyer does not admit that bran has the nutritious value claimed for it by many persons, since the nitrogenous compounds it contains are mingled with much non-assimilable matter.—12 *A*, *April* 20, 497.

PARKES ON EFFECT OF DIET AND EXERCISE ON ELIMIMATION OF NITROGEN.

Dr. Parkes, while investigating the effect of diet and exercise on the elimination of nitrogen, had for his subject a very healthy, powerful, and temperate young soldier. He conducted one series of experiments in which the man was fed on ordinary diet, and the amount of nitrogen-content was kept as near as possible constant. In a second series prepared food was given so as to keep the amount of nitrogen introduced perfectly constant; and a third series was made with non-nitrogenous food. These experiments showed distinctly an increased elimination of nitrogen in the period of rest after severe exercise, confirming Dr. Parkes's former results, and supporting the statement of Liebig on this point, in opposition to that of Voit. Whether it was diminished during exercise or not was not clearly shown by the experiments. The non-nitrogenous diet for five days neither raised nor lowered the temperature in the rectum of the patient, but apparently did not affect the health, nor did it alter the frequency of the pulse; but the heart's action became weak, and the pulse soft. The experiments proved that force necessary for great muscular work can be obtained by the muscle from fat and starch, though changes in the nitrogenous constituents of the muscles also go on, which have, as one effect, an increased elimination of nitrogen after the cessation of the work.—21 *A*, *June*, 413.

THE DELHI BOIL.

Intestinal worms, or entozoa, are, as is well known, frequent guests of the animal body, not even excepting that of man, and take up their abode, uninvited indeed, but none the less persistently, in almost every part of the system, whether in the intestines, the viscera, the eyeball, the brain, the muscles, or the skin. A newly discovered form of its intrusion appears to occur in what is called the Delhi boil, an affection which prevails in India, especially where impure water is used for ablution. The dogs drinking this water have these boils on the nose, while human beings are affected at the points where the skin is rubbed in the act of washing. A microscopical examination of the boil is said to show the presence of eggs of an intestinal worm belonging to the group of *Distomata*, of which the sheep-fluke is a well-known representative. These appear to penetrate the skin and produce the ulcer in question.—12 *A*, *August* 25, 329.

NET-WORK OF COAGULATED BLOOD.

An Australian microscopist corroborates the statement of Neumann that the net-work formed by coagulation in human blood can be distinguished under the microscope from that of the blood of other animals. If a small drop be placed on a microscope slide and carefully watched, at a temperature of fifty-five to sixty degrees it will be found to be broken up into a small pattern net-work, while that of other animals, such as the calf, pig, etc., requires a longer time for coagulation and fills a larger pattern; each species tested, however, having its own peculiar design, is readily recognized under the microscope.—17 *A*, *September*, 132.

AN EIGHTH RIB IN MAN.

Mr. Perrin makes a communication to *Nature* in regard to the occasional occurrence of an eighth true rib in man, although it has been generally considered that seven form the absolute limit. This eighth rib is sometimes found on one side only, still more rarely on both sides, and it is suggested by Mr. Perrin that cases of this abnormal character possibly occur more frequently than has been suspected. The maximum normal number of sternal ribs appears to be ten, but

in the higher primates the tenth, ninth, and eighth are successively lost in the transition from their lower to the higher forms. In the carnivora the sternal ribs are usually nine, although the Esquimaux dog, the arctic wolf, and the *proteles* have only eight. The common badger of Europe has ten true ribs.—12 *A*, 1871.

DIFFERENCE IN THE BLOOD OF THE EUROPEAN AND THE BENGALEE.

According to Dr. Bird, the blood of the Bengalee contains far fewer red corpuscles than that of the European; and it is to a deficiency in these corpuscles that the doctor ascribes the apathy of the Bengalee and his consequent subjection to the more sanguine European. The difference in question is believed to be due chiefly, if not wholly, to the circumstances in which the lot of each has been cast, since the inhabitants of swamps and jungles are supposed to be necessarily of lower organization than those of breezy and well-cultivated uplands. In farther comment upon this statement, it is remarked that throughout the animal kingdom generally the presence of these globules in greater or less proportions indicates a higher or lower organization, as they are absent from the blood of mollusks, but appear in increasing numbers at every upward stage in the scale of vitality, and in this way making one of the physical distinctions between man and woman. The moral elevation, therefore, of the Bengalee, as well as of woman, according to this theory, must depend largely upon some treatment which may tend to increase the amount of red corpuscles, and this is a problem which ought not to be difficult of solution in this day of extended physiological discovery.—6 *A*, *October* 29, 1870, 559.

SKIN-GRAFTING.

Several successful operations of so-called skin-grafting have lately been performed in Paris and London, as well as in New York. This consists in transplanting portions of healthy skin from one part of the body to some other which is in a diseased condition. In one instance fourteen patches were transferred on the same patient so as to produce a very great improvement in her personal appearance. Care should be taken to transplant no fat, but only the skin, which must be accu-

rately applied to the granulating surface.—5 *A*, *January*, 1871, 100.

GRAFTING OF PART OF ONE ANIMAL IN ANOTHER.

Many curious accounts have been published of the readiness with which the living portion of one animal can be grafted into the body of another, and continue to grow indefinitely afterward, so as to constitute an integral portion of the latter. An interesting case of this kind has been published by Mr. Phillipeaux, although the experiment itself was made nearly twenty years ago. The gentleman in question, after having made an incision in the head of a young cock, introduced into it the incisor tooth of a Guinea-pig that had been born a few hours previously, and which, complete and furnished with its bulb, was so placed that, the bulb being at the bottom of the wound, the extremity of the tooth turned outward. On the day the experiment was made the tooth was eight millimetres long and two millimetres thick, and when the animal was killed, ten months afterward, the total length of the tooth was found to measure thirteen millimetres. While at the beginning of the experiment the tooth was completely imbedded in the incision made, at the expiration of the period mentioned it projected five millimetres from the surface. The interest of this experiment consists in the fact of a graft having been made from one animal to another of an entirely different class, which, of course, is more astonishing than the transfer of the spur of a cock to its comb, as made by Hunter and Sir Astley Cooper, or the amusing operation, said to have been performed by some French Zouaves, of introducing the end of the tail of a rat into the skin of the forehead, and after keeping it in that position until the juncture had taken place, cutting off a portion of the tail and leaving it to project from the forehead like a horn, thus producing an animal of such an extraördinary physiognomy as to have deluded a naturalist into the belief that he had before him a remarkable new form of rodent.—12 *A*, *July* 28, 262.

M'DONALD'S THEORY OF NERVOUS ACTION.

Dr. Robert M'Donald has presented a new theory of nervous action to the Royal Irish Academy, this being expressed

in the words of the author as follows: "I conceive that the various peripheral expansions of sensitive nerves take up undulations or vibrations, and convert them into waves, capable of being propagated along nervous tissue (neuricity, as it has been named). Thust he same nerve tubule may be able to transmit along it vibrations differing in character, and hence give rise to different sensations; and, consequently, the same nerve tubule may, in its normal condition, transmit the wave which produces the idea of simple contact, or that which produces the idea of heat; or, again, the same nerve tubules in the optic nerve which propagate the undulations of red, may also propagate, in normal vision, those which excite the idea of yellow or blue, and so for other senses. I advocate this undulatory theory of sensation in preference to the theory of distinct conductors: first, because it is simple; second, because it is strongly supported by analogy when compared with wave propagations in other departments of science; third, because it appears to be in harmony with a large number of recognized physiological facts, which seem inexplicable upon the theory of distinct conductors."—5 *A*, *July*, 329.

MIND IN LOWER ANIMALS.

Dr. Lauder Lindsay, in an essay which has excited some attention, takes the ground that the mind of the lower animals does not differ in kind from that of man, and that they possess the same affections, virtues, moral sense, and capacity for education, and are liable to the same kinds of mental disorders.—12 *A*, *June* 29, 169.

RAPIDITY OF MENTAL TRANSMISSIONS IN A NERVE.

Professor Helmholtz has made some new measurements of the rapidity with which excitation is propagated along the motor nerves of man from the brain to the muscles. The ascertained rapidity of the excitation varies between 260 and 292 feet per second, and is also found to be greater in the summer season than in winter. This result led to a more exact observation of the influence of temperature, which was ascertained by the artificial cooling or warming of the arm. By this means the accelerating influence of a higher temperature has been clearly determined, so as to show that the interval of time between an impulse of the voluntary power

and the corresponding movement of the muscle is greater in winter than in summer.

IS THE BRAIN A GALVANIC BATTERY?

Among the supposed facts relied upon to prove that the animal brain is a battery, which can send currents of electricity through the nerves so as to act upon the muscles, is an experiment referred to by Mr. C. F. Varley, which consists in connecting the two terminals of a very sensitive galvanometer with separate basins of water. If a hand be placed in each basin, and one be squeezed violently, a positive current is said generally to flow from that hand through the galvanometer to the other hand, which is not compressed. Mr. Varley, however, after various experiments, has come to the conclusion that the phenomenon is due to chemical action alone, the act of squeezing the hand violently forcing some of the perspiration out of the pores. This is proved by the fact that when both hands were placed in the water, and a little acid was dropped on one of them, a current was generated without any muscular exertion. Mr. Varley found nothing to show that electricity exists in the human body, either as a source of motive power or otherwise, and he considers the feeble electricity obtained from the muscles to be due to the different chemical conditions of different portions of the muscles themselves. As the force transmitted by the nerves is at a rate about 200,000 times slower than an electric current, he infers that it can not be an electric current itself.—13 *A*, *March* 1, 161.

HALFORD CURE FOR SNAKE-BITES.

The much-talked-of method adopted by Dr. Halford, of Melbourne, for curing the bite of poisonous serpents, by injecting under the skin about 30 drops of liquor ammoniæ, has not succeeded very well in experiments in India and some other parts of the world. In a recent communication Dr. Halford remarks that as the power of the ammonia injected is expended, fresh supplies must be used, and that the greatest care must be taken that none of the ammonia be spilled, or sloughing will follow. He has changed his views in regard to the physiological action of the poison and of the remedy, to the extent that whereas formerly he thought that,

in consequence of the entrance of the poison into the blood, a rapid growth of new cells occurred, which choke and exhaust both the fibrin and the oxygen of the blood, and render it incapable of any longer ministering to the wants of the system, he now thinks that the new corpuscles are only the ordinary white corpuscles of the blood strangely altered and colored, the change in them being caused by an alteration of the medium in which they float; this alteration being, in fact, a disappearance of the fibrin under the action of the poison. The ammonia, of course, in Dr. Halford's view, counteracts this power of the poison.—13 *A*, *September* 13, 319.

HALFORD METHOD OF CURING SNAKE-BITES.

A great contrariety of opinion seems to exist in regard to the value of Dr. Halford's method of treating snake-bites. The American and European physiologists who have discussed the question, or who have repeated the experiments, appear to attach very little value to it, but the Australian faculty are quite unanimous in their indorsement.

Professor Halford, in a recent communication, discusses the symptoms of 20 cases treated by his process, under the hands of different practitioners, widely remote from each other. In 17 cases recovery followed, and in 13 of these the practitioners were of the opinion that death would certainly have ensued without this counteracting agency. The treatment consists in injecting about three minims of dilute ammonia, of the specific gravity of .959, into a superficial vein, by piercing its coats with the nozzle of a hypodermic syringe. The curative effect is said to be almost immediate, and several physicians stated that the recovery from collapse was so rapid and startling as to be almost magical. It still remains a question, however, whether, notwithstanding Dr. Halford's assurances, the Australian snakes are really as venomous as those of America—the contrary being, it is understood, the opinion of Dr. Krefft, of Sydney. We await with much interest the result of renewed experiments in this country, and can only express the hope that the application may be successful in cases of bites of rattlesnakes and copperheads, since in the latest memoir on the venom of the rattlesnake, by Dr. Mitchell, of Philadelphia, he expresses the opinion positively that no remedy exists in cases where the poison is mature, and has

been fairly introduced into the circulation in sufficient quantity.—12 *A*, *September* 8, 381.

MBOUNDOU POISON.

Mr. Du Chaillu, in the account of his travels, gives some interesting particulars in regard to the use, by the natives, of what he calls the ordeal root of Goumbe, or the mboundou of the natives. A recent report upon this plant to the Paris Academy informs us that it is a new species of the strychnine group, differing somewhat from the true strychnine, as shown by experiments prosecuted upon frogs, in not causing rigidity. When a very weak dose is injected under the skin of a frog, the poison simply produces constraint in the limbs, or a sort of paralysis, which prevents it from leaping easily, and forces it to crawl. With a larger dose similarly introduced, tetanic convulsions are brought on when the animal is touched, or when the table on which it lies is struck by the hand. Unlike the action of woorari, the power of muscular contraction is not impaired when the operator excites the nerves.—17 *A*, *September*, 131.

POISON OF THE SCORPION.

Quite a diversity of opinion has prevailed among observers in regard to the true character of the poison of the scorpion, and the danger from wounds inflicted by it, this, perhaps, dependent to a great degree upon the difference in the species examined. By some its bite is thought to be more fatal than that of the venomous serpents; but, on the other hand, there are not wanting those who ridicule the idea of any dangerous consequences. In a recent paper by Jousset, the subject is critically investigated, and the results of experiments upon three species are presented. One of these, the common scorpion of Europe, is dismissed by him as being entirely insignificant, on account of its small size, which scarcely exceeds an inch in length. A second species, the *Scorpio occitanus*, is more than twice the length of the first mentioned, and its bite proved to be in many cases very serious, although not fatal. A third species, however, the African scorpion, which sometimes attains a length of from four to six inches, our author found not unfrequently to produce a mortal wound. As is well known, the venomous apparatus of the scorpion is sit-

uated in the end of the tail, and consists of a blackish, recurved point, pierced near its tip by two small slits, which allow the venom to pass into the wound when inflicted. But even with the most venomous species the result is not an instantaneous death in the case of the larger vertebrates, a certain length of time being required to allow the physiological effect of the poison to develop itself. The venom is a colorless and limpid liquid, acid, soluble in water, but little so in alcohol, insoluble in ether, and of a density a little greater than that of water. A microscopical examination shows it to be a perfectly transparent liquid, with a few epithelial cells and fine granules.

When we consider the small quantity of poison which a scorpion can emit, scarcely the three hundredth part of a grain, and bear in mind that this may cause death in a large dog, we may well admit that the animal is in reality much more poisonous than even the rattlesnake, of whose venom a much larger amount is usually injected into the wound.

Our author, after narrating an extensive series of experiments, made principally upon the frog, came to the conclusion that the venom, in its poisonous influence, acts directly upon the red globules of the blood, and in no other way, causing them to lose their individuality and to become agglutinated together, so as to constitute masses, which obstruct the entrance to the capillaries, and thus stop the circulation, ultimately producing death. This is generally unaccompanied by any inflammation, the skin in the frog assuming a violet tint, and seeming as if injected. The particular member infected generally becomes completely rigid.—6 *B*, *Sept.* 5, 407.

ABBÉ MOIGNO ON THE MODERN ARGUMENTS RELATIVE TO THE ANTIQUITY OF MAN.

During some remarks at the late meeting of the British Association, which followed the reading of a paper by the Abbé Richard upon certain flint implements found in Joshua's tomb at Galgula and at Mount Sinai, the Abbé Moigno, the well-known editor of *Les Mondes*, said that he had spent nine months of a painful and dangerous leisure given him by the Franco-German and the civil wars in studying thoroughly the great and solemn question of the indefinite or very remote antiquity of man, in so far as it had been proved by the

discovery of human remains, or those of human industry, found in the ground at a greater or lesser depth. He had carefully read, or rather studied in the most complete manner, all that had been published on that subject—the works of Lyell, Sir John Lubbock, Dr. Evans, Prestwich, Pengelly, Buchan, Vogt, Desor, Morlot, De Mortillet, etc. For many years he had read and followed all that had been written on these subjects, and he now made it his duty to declare solemnly, after this tiresome and patient study, that none of the discoveries, none of the facts brought forward, often with a great deal of precision, have the importance that has been attributed to them; that not only the existence of man in the pliocene, eocene, and miocene ages, as Dr. Evans had declared so authoritatively, is not at all proved, but that the quaternary soils in which human remains or remains of human industry have been found are certainly moving soils, movable on declivities, as is affirmed by the eminent geologist, M. Elie de Beaumont; that the soils of the stalagmitic caves, like the celebrated cave of Torquay, which so much occupied the attention of the British Association, have been overrun by water, or some other natural agent, in such a manner that the layers of mud originally laid on the stalagmites have slipped below them, but that even geology must remain quite apart from archæology and human palæontology, because its work had come to an end when man had appeared on the earth.

He added, while requesting indulgence for the liberty he was taking, that the question of man, in connection with geology or palæontology, is exactly at the same point which this question had formerly: first, its relations with the history of Indian astronomy as practiced by the unfortunate Bailly, at the time when Laplace threw so brilliant a light on the errors of his illustrious fellow-laborer; second, in its relaitons with the discoveries of the zodiacs of Denderah and of Esne, from his investigations of which the immortal Champollion earned the name of *Cæsar Autocrator*. The arguments in favor of the existence of man several ages previous to the epoch fixed by the Holy Bible for the creation of Adam—an epoch which it is, however, impossible to determine, and which can be taken back to 10,000 years—had reached their maximum to-day; they would only decrease day by day until they vanished.—18 *A*, *August* 25, 563.

ANTIQUITY OF MAN.

Professor Duncan, in addressing the British Association upon the principal geological changes which have occurred in Europe since the appearance of man, premised that no trace of man has been found associated with any deposits formed during the glacial period in Northern Europe. The earliest remains of man and his works, and of the beasts associated with him and hunted by him, rest upon these deposits resulting from glacial causes, and are, therefore, later in time. A second period, however, of mountain glacialization took place, when the glaciers of the Alps and Pyrenees especially extended far into the districts below them. This was subsequent to the existence of man, since the mud and gravel produced by the grinding down of the mountain sides during this period, and its stratification over the plains, are found to cover the remains of man and his works, and, therefore, to be of a later epoch.

This second glacialization, and the arrangement of the wash, are suggested as forming a line of separation between the palæolithic period, when man used rude stone weapons, and the neolithic period, when smooth and polished instruments were manufactured, and, in a general sense, marking the time when the great mammalia disappeared from the northern and western parts of Europe.

Among the principal geological changes which occurred after the appearance of man in Europe, our author enumerates the subsidence of an area of land which connected Sicily with Crete and Northern Africa north of the Sahara; the formation of the Straits of Gibraltar; the excavation of the valleys of Northern and Eastern France; the separation of the coasts of France and England, in the region about Dover and Calais, and that of the Isle of Wight from the main land; the formation of a great part of the Bristol Channel; a considerable upheaval of the Scandinavian peninsula and Denmark; the uprise of the Desert of Sahara, in Africa, after the second extension of the Alpine glaciers.—10 *A*, *Sept.*, 440.

MAN IN THE TERTIARY PERIOD.

In a work on the geology of France, published in 1868, the author, M. Raulin, took strong ground against the authentic-

ity of certain asserted flint implements found in the fresh-water limestone (lower miocene) of Beauce, and which had been claimed to indicate the existence of man in France during the tertiary period. This gentleman now takes pains to apologize for his skepticism as previously expressed, in consequence of the careful examination to which he has lately submitted both these specimens and the locality where they occur. He now considers the fact as established indisputably that the genus *homo*, or man, did really exist at the time mentioned, and that we may assume as proved that it extended through at least five successive faunas, viz.: the limestone of Beauce, or the lower miocene, the Falun, the Touraine, the pliocene or diluvium, and the modern epoch. While, however, entirely satisfied of the human origin of these early remains, he by no means assents to the idea that they belonged to the present species of man, but thinks that the existence of these remains, through such a range of formations, proves unquestionably that their makers must have possessed characteristics in structure of special peculiarity; and since the genus rhinoceros occurs in these same five successive faunas, represented in each by distinct and successive species, which, whether evolved one from the other, or the subject of as many distinct creations, yet exhibit strongly-marked differences, he suspects that the species of the genus man in all probability also varied in like manner. M. Raulin expressly desires that his remarks on this subject may not be taken as asserting a belief in the transformation of these different species of man one from another, or as to the descent of the older species from a common stock with that of the primitive monkey; but he thinks that, as we have no means of judging the characteristics of the tertiary man excepting by the rude implements he has left, should his remains ever be discovered, the present suggestions on his part will be thoroughly substantiated.—1 *B*, *August* 14, 152.

WEAVING AMONG LAKE-DWELLERS.

An interesting communication was presented by Dr. Weigert, before an industrial society in Prussia, upon the products of spinning and weaving discovered in the pile dwellings of Switzerland, in which he showed that even in the stone period flax was cultivated in large quantity, and worked up in the

most varied fabrics, including the making of thread, ropes, etc. Remains of spinning-wheels of stone and clay are very abundant, as also the relics of the manufactured articles themselves. Plaited fabrics, which served as mats, coverlets, and walls, showed the extended use of this branch of manufacture. The remains of spindles proved conclusively that the art of weaving was known to these people, and that they used a loom with the chain standing vertically instead of horizontally. An important conclusion was derived from this fact by the author in regard to the development of civilization on the part of these people; since of the two methods, namely, whether the chain is horizontal or vertical, the former has been peculiar to India and Egypt from the earliest period, while the latter was used among the Greco-Italian nations, a proof that the European culture was not influenced by Africa and Asia until it had itself made considerable progress.—14 *C*, CXCVIII., 308.

SHELL-HEAPS IN NEW BRUNSWICK.

Of late years many discoveries have been made in regard to the habits and characteristics of the aborigines inhabiting the coasts of North America prior to the time of Columbus by careful examination of the artificial heaps of refuse shells, bones, etc., accumulated in the vicinity of their villages. The published researches of Professor Wyman and others have proved full of interest; and as the subject continues to excite the attention of American archæologists, we doubt not that much now hidden will yet be brought to light. As these deposits are usually on or very near the sea, they are much exposed to the wearing of the waves; indeed, their discovery is usually due to exposure of a section by this influence. For this reason, it is of importance that the examinations in question should be prosecuted before the heaps have entirely disappeared, as a large proportion will probably not outlive the next half century. We learn that a careful search on the shores of Kent and Northumberland counties, on the eastern coast of New Brunswick, has shown that, in consequence of the wearing away of the soft sandstone shale of the coast for many rods, all traces of the shell deposits, believed to have once existed in abundance, have now entirely vanished.

PRE-HISTORIC ENGRAVINGS ON BONE.

Many of our readers are familiar with the magnificent work of Messrs. Lartét and Christy, entitled "Reliquiæ Aquitaniæ," principally embracing illustrations and descriptions of the remarkable relics of pre-historic times found in the caverns of Aquitaine and other parts of France. It is among these remains, for instance, that occur the curious engravings, by men of the reindeer period, of various animals with which they were contemporaneous, the most remarkable being one of what is believed to be intended to represent the hairy mammoth of that period. Quite recently other remains of a similar character have been brought to light from the same locality, one of the most noticeable being an engraving on a reindeer's horn, representing a male bison pursued by a naked man, the latter grasping the animal by the tail with one hand, and with the other plunging a lance into its body. The drawing of the man is said to be the best illustration of the "humanity" of the period that has hitherto been discovered. The absence of clothing is believed to prove that he habitually went naked. The head is brachycephalic, with hair standing stiffly on the cranium, and there is a short, pointed beard on the chin.—3 *C, October* 8, 973.

TRANSMISSIBILITY OF INTELLECTUAL QUALITIES IN ENGLAND.

At a late meeting of the Statistical Society of London, according to *Nature*, Mr. Hyde Clarke read a paper upon the "Transmissibility of Intellectual Qualities in England." As one test of this question, he took the statistics of writers of books in the "Biographia Britannica," and ascertained that of 2000 authors, 750 were born in country districts and 1250 in towns. Examining the towns and the distribution in them, 333 were allotted to London, 73 to Edinburgh, and 53 to Dublin. The largest numbers beyond these were found in cathedral and collegiate cities. The deductions he drew were, that intellectual activity is distributed unequally, but that it is more among the town or more highly educated population than among the rural. He pointed out that the larger the concentrated educated population, the larger is the intellectual development; and he referred to the like examples of Greece, Rome, and modern Europe, where the same law is to

be traced. The great modern centres of industry in England occupy a low relative position in the list, and are scarcely to be noticed, but they are now beginning to contribute. He affirmed that the literary class was produced from the educated class, and not from the illiterate classes. While no educational effort will produce men of great genius, he inferred that literary attainments are in relation to literary culture, or the culture of the educated classes; and that, by extending education to other classes of the population, the intellectual capacity of the community will be extended and propagated within certain limits.—12 *A*, *June* 22, 154.

ANTIQUITY OF THE CAT.

In a communication to the Academy of Sciences of Paris Mr. Lenormant calls attention to the fact that the common cat was introduced into Egypt at a comparatively late period; so much so, indeed, that it is not mentioned at any time in the Bible, and it is believed to be without a generic name in Hebrew. It was unknown to the Assyrians and Babylonians, and in their peculiar nomenclature the lion and the panther were referred to the dogs for want of a different point of comparison among their domestic animals. It was not until the Semite period that we find any pictorial illustrations of this animal. Tardy as was its introduction, however, into Egypt, it seems to have been still later in getting into Greece and Rome, delineations of it being entirely wanting on the monuments of these countries. Its place as an exterminator of rats was supplied among the Greeks by the fitch-marten, or European polecat, while the Romans made use of another species of weasel for the same purpose. According to Professor Pictet, the names of the cat, in all the European languages, do not belong to the earlier period of the Aryan language, but are of a recent date, and derive their origin from the Latin *catus*. As a domestic animal, nevertheless, the cat was of decided antiquity in India, even if unknown to the primitive Aryans.—6 *B*, *Nov.* 21, 738.

ANTIQUITY OF THE PIG.

According to Mr. Lenormant, the pig was not known as a domestic animal in the primitive civilization of Egypt. It is not mentioned in the text either of the ancient or of the mid-

dle empire, while figures of it are entirely wanting on the monuments of these two great periods of Egyptian culture. At that time, however, the pig, in its wild state, must have been abundant in the marshes of Lower Egypt, where it still occurs, and supplies food to many of the Mussulman fellahs, in spite of the prohibitory precepts of the Koran. The lack of figures of the wild boar in the ancient Egyptian monuments is perhaps to be explained by the idea of absolute impurity which the Egyptian religion attached to the wild and domestic pig preventing them from considering it as either game to be pursued or flesh to be eaten. But at a later period of Egyptian culture the animal makes its appearance in the monuments of the country, although not prior to the time of the eighteenth dynasty, during which drawings of pigs were represented upon the rural scenes, and painted upon the walls of the tombs.—6 *B*, *Dec.* 12, 849; *Dec.* 19, 952.

RATS IN THE LACCADIVE ISLANDS.

Our readers may be perhaps aware of the efforts made in the French West Indies to exterminate or reduce the numbers of poisonous serpents abounding in those islands, principally by the introduction of the mungoose, and by allowing the common hog to run wild. A similar attempt at antagonizing an inconvenient development of animal life, in the form of droves of rats, has lately taken place in the Laccadive Islands, a group situated in latitude 12° north and longitude 2° east. These are coral islands, in which the rats were not indigenous, but were introduced by their escaping from certain vessels wrecked on the shores. They have now multiplied to an enormous extent, and have become most inconvenient pests. On one of the islands, where a few years ago thirty or forty thousand eggs of gulls could be gathered in a few hours, the birds have been entirely exterminated or driven away by their four-footed enemies.

The use of dogs being inadmissible on account of the religious prejudices of the native inhabitants, the experiment was made of transporting fifty mungoose, which were placed on some of the islands, and fifty East Indian snakes, which were introduced on others, the two not being brought together on account of their mutual antipathy. It is expected that both will multiply in the course of a few years so as to

thin out or exterminate the rats; and, as the serpents are perfectly harmless, it is not believed that their presence in any number will be at all injurious, especially as in the absence of abundant prey they would starve out in a short time. The mungoose again, being a conspicuous animal, can be easily reduced in number or entirely destroyed when their services cease to be of use, their habits also being such as to keep them more readily under the eye and control of man, thereby enabling him to destroy them at pleasure.—2 *A*, 1871, *August* 5, 77.

PRE-HISTORIC HORSE.

According to Professor Owen, who has examined animal remains from the cavern of Bruniquel, the human bones show most affinity with the Celtic types, the cranium being oval and rather dolicocephalous than brachycephalous in general proportion. The cranial capacity corresponds to that of uneducated Europeans of Celtic origin, and exceeds that of the average of Australian aborigines.

Professor Owen, referring to certain carvings on the animal bones accompanying the remains, says that some of them are pictures of the heads of horses, and show much artistic skill. They represent an animal with short pointed ears, the stallions having beard-like hairs. The tails of the horses also appear to have been short, and furnished with long hairs to their base instead of having these hairs form a kind of tuft nearer the end of the tail. Professor Owen finds no evidence any where of an aboriginal wild horse resembling that of the present day, no remains of the kind existing in any museum; and it is probable that the delineations of the cave horse of Bruniquel represent all that we are likely to know of the form of the primitive stock from which the present horse is descended.—4 *D*, L., 423.

MONSTROSITY IN A HORSE'S HOOF.

Some of our readers may be interested in an account of a curious monstrosity in the hoof of a horse, as reported in the Proceedings of the Royal Asiatic Society of Bengal. In this animal a supernumerary digit was formed on each fore foot, incased in an asymmetrical hoof, a similar condition occurring on the hind foot, but with less regularity. This speci-

men recalls very vividly the peculiar condition of the hoof in the extinct genus *Hipparion*, which, according to many writers, is one of the original ancestors of the genus to which the modern horse belongs.—12 *A*, *November* 16, 394.

VISION OF THE YOUNG MOLE.

It is a fact well known to naturalists that in many cases where a full-grown animal is marked by the absence of certain organs or appendages found in the majority of its class, they exist in a normal condition in the fetal stage. This is shown in the occurrence of teeth in the jaws of the young whale (which are totally wanting after birth), the incisor teeth of the fetal rodent, the existence of eyes on both sides of the head in the young flounder, etc. A new instance of this general principle has been recently announced in regard to the European mole, the adult of which is usually considered to be blind. The fetal mole, however, according to Mr. Lee, in a late paper, is endowed with organs of vision, which at the time of birth are of considerable perfection, but in advancing age certain changes take place in the base of the skull, which terminate in the destruction of the most important structures on which the enjoyment of the sense of sight depends.—5 *A*, *October*, 1870, 446.

NEW-BORN HIPPOPOTAMUS.

The female hippopotamus at the Zoological Gardens of London not long since gave birth to a young one, which, we regret to say, died a few days afterward, making the eighth case in which births of this animal have occurred in Europe—all of them dying, with a single exception, before reaching maturity. This one, born in Amsterdam, was almost equally unfortunate, as it was destroyed many years ago at the burning of the Crystal Palace in New York. A post-mortem examination of the case first mentioned showed that it must have had chronic peritonitis before birth, as its stomach and liver were adherent to the peritoneum.—20 *A*, *March* 4, 253.

DECIDUOUS NATURE OF THE RHINOCEROS'S HORN.

The statement that the horn of the rhinoceros is deciduous, or, at least, can be reproduced when accidentally lost, has been confirmed lately at the Zoological Gardens in London.

One of the animals, a male Indian rhinoceros, had been in the habit of trying to raise a transverse bar keeping him off from the pen of the female, and this was attempted at one time with so great violence as to tear the horn entirely off. Considerable loss of blood ensued, which, however, was soon stopped, and the surface healed. Soon after indications were observed of the formation of a new horn, which, at the date of the account, had already attained a height of one and a half inches. The old horn was about twelve inches high, and its base eight and a half inches in the long diameter and five and a half across.—11 *A*, *Jan.* 3, 1871, 9.

HABITS OF THE NARWHAL.

The announcement of the presentation to one of the English museums of a narwhal having two tusks instead of the one usually occurring has elicited some interesting communications from various parties in reference to the habits of this animal. Mr. Gray, in *Land and Water*, states that the narwhal is gregarious, and quite abundant in the northern seas, the males and females being usually in separate herds. They are said to be ground feeders, living mostly upon cuttle-fish, their stomachs being commonly full of the remains of this animal. They, however, feed also upon the different kinds of true fishes. Mr. Gray thinks that the horns of the males are used for stirring up the mud while searching for food as well as for weapons of defense. One observed by him had a horn eight feet in length, and on being struck he ran at the boat and drove his horn through its side into the thwart, where it broke short off, leaving about six inches in the boat. The flesh is said to be quite good for food, being tender and of a gamy flavor. It is preferred by the Esquimaux to any other kind of food.—2 *A*, *February* 11, 104.

SCARCITY OF REMAINS OF THE UPPER JAW OF MARSUPIALS.

A large number of fossil mammals are only known from the teeth and bone of the lower jaw, these being preserved when no other trace (of the head at least) remains. This is especially the case with the small marsupial mammals, found in the mesozoic rocks of Great Britain, where, out of 10 genera and 25 species, based upon numerous specimens, not more than half a dozen series of teeth of the upper jaw have been discovered, and no crania.—5 *A*, *July*, 321.

FOSSIL CETACEANS IN HOLLAND.

Much interest has been excited in Europe by the discovery in Holland of extensive beds of remains of cetaceans and other marine vertebrates, as many as 8 new genera and 16 new species having been secured, together with the walrus and the remains of seals. The collection is in charge of the Vicomte du Bus, who is preparing a report for publication.—12 *A*, *November* 16, 392.

FOSSIL WHALE IN CANADA.

At a meeting of the Natural History Society of Montreal the discovery was announced, by Mr. Billings, of the nearly complete skeleton of a fossil whale at Cornwall, Ontario County, at about 60 feet above the level of the St. Lawrence. It is believed by Mr. Billings that this fossil is identical with one obtained in Vermont by Professor Thompson, in a railway cutting about 12 miles south of Burlington, and called *Beluga vermontana*. This is closely allied to the white whale of the St. Lawrence, though differing in some special points.

SEGUIN COLLECTION OF FOSSIL MAMMALS.

Palæontologists are aware of a work on the fossil mammals of South America, published by a Frenchman named Seguin, and containing descriptions of various species of Megatherium, Megalonyx, Glyptodon, Chlamydotherium, Toxodon, etc. We learn from a paragraph in our exchanges that this entire collection—one of the finest ever made in the La Plata region—has been offered to the French government on condition that it will refund the expenses incurred in gathering it, and defray the carriage to France. We presume that advantage will be taken of the offer, and the collection be ultimately carried to Paris.—2 *A*, *August* 6, 88.

DUNS ON THE RARER RAPTORIAL BIRDS OF SCOTLAND.

Professor Duns, of Edinburgh, in a paper "On the Rarer Raptorial Birds of Scotland," presents the following propositions: 1. That species occur in pairs, after long intervals, in localities where they have long since ceased to breed, but where they have been at one time not uncommon. 2. The

geographical range of stragglers seems to widen with the lapse of time. 3. Certain species have greatly increased in recent times over wide districts where they were comparatively rare. 4. Year by year the raptorial birds of Scotland are becoming fewer.

He remarked also that by a comparison of Sibbald's list of birds in "Scotia Illustrata," 1684, with other authorities, he had arrived at the conclusion that most of the larger raptorial birds were rapidly disappearing from Scotland, and that even the smaller forms, which were common in the southern and central districts, were yearly becoming rarer. He also expressed his opinion that both the farmer and the game preserver would lose much when, between them, they succeeded in destroying all the hawks and owls.—12 *A*, *Aug.* 24, 333.

VARIATION OF COLOR IN BIRDS WITH THE LOCALITY.

The subject of variation of color in birds, as expressing specific distinctions, has for a long time occupied the attention of ornithologists; and while, with some, the slightest difference in shade was sufficient to establish a separate species, a wide variation is allowed by others without affecting the idea of specific identity. We are gradually, however, coming to appreciate the influence which external conditions, such as light or shade, moisture or dryness, varying temperature, latitude, etc., produce upon color, and so long as the general pattern remains the same we can allow a great variation in tint, and even in size, since, as is well known, this depends largely upon latitude or altitude of birthplace and residence. As a general rule, it may be said that as we go southward from a north-temperate latitude, with the increasing temperature and brighter sky the colors are deeper and the size less; and, on the other hand, in proceeding northward and into more clouded atmospheres, the dimensions become greater, with a decrease in general brilliancy. In sandy or barren regions the accompanying birds become of a grayish tint, while in red soils a reddish shade will be appreciable.

Again, in certain regions, the birds exhibit a tendency to melanism, or a blackening, this being noticeable in Florida, and more especially in the West India Islands, as compared with the United States. An instance of this is seen in the common red-winged blackbird, the female of which, as found

in the United States, is variegated with brown, yellowish, and grayish streaks, the male alone being a glossy black, with red shoulders. A blackbird is found in Cuba, however, the male of which is undistinguishable from our bird, excepting in the smaller size, while the female is of a uniform lustrous black, differing only from the male in the absence of red upon the shoulders. Similar comparative peculiarities are presented in quite a number of West Indian birds.

MARKS OF DIFFERENCE OF SEX IN EGGS.

It is stated that the eggs of the common hen, as well as those of many other birds, present certain external characteristics by means of which it is possible to determine beforehand the sex to be hatched from them. Thus the "male" egg has, at its pointed end, small folds and wrinkles, while the "female" egg is entirely smooth, and well rounded off at both ends.—10 *C, March* 1, 1870, 42.

PETREL OIL.

Ornithologists are well aware that certain kinds of sea-fowl belonging to the petrel family are in the habit of disgorging a quantity of oil when captured, and that this furnishes in large part the food with which they supply their young. Many of these species excavate a burrow in the earth, in which their single egg is laid, and the young bird, when hatched, is left for a long time while the parents are abroad occupied in the business of procuring food. The oil in question, according to some, is obtained from dead and floating cetaceans or fish; according to others it is a regular secretion. In either case the amount is so great that the inhabitants of the island of St. Kilda are in the habit of hunting the Fulmar petrel for the purpose of catching it and causing it to disgorge this oil, which is done by dipping the bill of the bird into a small leather bag suspended to the waist. The amount obtained in this way is sufficiently great to furnish an article of export, and it is suggested that it may probably possess virtues corresponding to those of the cod-liver oil. A recent investigation shows that it is soluble in ether, and much less so in alcohol, and has other reactions which place it side by side with the cod-liver oil.—17 *A, December*, 187.

RATIO BETWEEN THE SIZE OF THE CHICK AND THE EGG.

According to a German author, the chick, at the moment of escape from the egg, weighs about two thirds as much as the original egg. If, therefore, it is desirable to have strong and large chicks, it is necessary to see that only the heaviest eggs are hatched. The average weight of hens' eggs may be estimated at about ten to the pound; some weigh considerably more, and others much less than this proportion. By pains in selecting large eggs, it will be possible, according to the usual theory of selection for breeding, to secure a race of chickens of large size.—9 *C, June*, 45.

DODO PIGEON.

A contemporary gives an interesting account of the tooth-billed or dodo pigeon (*Didunculus strigirostris*) lately sent to London from the Samoan Islands, and we may perhaps supplement that account by mentioning the fact that this bird was first collected by the naturalists of the United States Exploring Expedition under Captain Wilkes, and described by Mr. Titian R. Peale, the veteran zoologist. Two specimens were brought back by Captain Wilkes, one of them now contained in the collections of the National Museum under the charge of the Smithsonian Institution at Washington, the other belonging to the Museum of the Academy of Natural Sciences, Philadelphia. The species is, as stated in the article referred to, nearly extinct, and will probably be entirely exterminated in a few years, when it will take its place with the great auk, the dodo, and many other species that have disappeared from the surface of the earth within the historical period. The resemblance of the bill of this bird to that of the dodo is quite marked, and by studying its character naturalists were led to refer the giant dodo to the pigeon family, and not to that of the vultures, as had been previously suggested.

GEOGRAPHICAL DISTRIBUTION OF THE OSTRICH.

The ostrich has usually been considered as peculiar to the continent of Africa, where two species have been recognized, one belonging to the northern portions, the other to the regions nearer the Cape of Good Hope. Curiously enough,

these species were for a long time considered to be the same, and their distinctness was first suggested by the marked difference in the texture of the egg. In a recent work by Hartlaub and Finsch on the birds of Eastern Africa, it is shown that, contrary to the general assumption, the ostrich, probably that of Northern Africa, if not, indeed, a third species, was known at a very remote period in Central Asia, and perhaps even in India; and that at the present time it occurs wild in Syria, Arabia, and Mesopotamia, where, in fact, it was mentioned by the earliest writers, among them Herodotus, Aristotle, Diodorus, etc.—17 *C*, 1870, 380.

BREEDING OSTRICHES IN CAPTIVITY.

The many efforts made in Europe to breed ostriches in a state of captivity have finally resulted in success, the Zoological Garden of Florence being the happy possessor at the present time of several healthy young birds. The stock consisted originally of one male bird, and of one old and one young female. One set of eggs was laid in 1868, but these did not hatch. In March of 1869 the laying commenced anew, and first one female and then the other deposited her eggs in the same nest until the number amounted to ten. These were then brooded upon in the daytime by the male, and in his absence occasionally by the older female, the younger one showing great reluctance to approach the nest excepting at night and in the colder weather, when the eggs were divided among the three, each brooding over its share. In the morning, however, when the females left their nests, the male bird drew to himself, with his bill, the eggs which had been covered by the older female. The younger one, however, always took up a position so far from the others that the male bird could not reach her eggs, and the attendants of the museum were obliged to push them near to him. The brooding lasted until the 27th of June, when the female remained quietly sitting on the eggs, the male running around the park in a very vicious manner. In a short time five ostriches made their appearance around the old bird, the remaining eggs producing nothing. One of the five young birds died, apparently from overeating, but the remaining four were in good condition at the latest report, and likely to attain maturity. Should it be found practicable to raise os-

triches in a state of domestication without too much trouble and expense, the broods may be rendered of much pecuniary value, since the plumes alone of the male birds will bring a price so great as to yield a handsome return, and the remaining feathers of the body generally of both sexes can be turned to economical account. How far ostriches can be utilized in civilized countries as animals of draught and beasts of burden, as they are said to be employed in Africa, remains to be tried.—1 *C*, XXXI., 459.

BREEDING OF OSTRICHES IN CAPTIVITY.

The preceding article has reference to the subject of the breeding of ostriches in captivity in Europe, and we are reminded that this is a practice of common occurrence in South Africa, where large numbers are kept for the purpose of securing successive crops of their feathers, and are inclosed in areas of fifteen to twenty acres, encircled by low stone walls. Their eggs are usually hatched artificially by being kept at a temperature of about 100 degrees by the aid of an oil lamp. The long white feathers of the wings of the male birds are the most valuable, bringing from $150 to $200 a pound, eighty feathers usually making up this weight. The feathers from the wild birds are, however, considered more valuable than those taken on the farms.

MAREY'S APPARATUS FOR RECORDING THE FLIGHT OF BIRDS.

Much interest was excited by the account given a year or two ago by Professor Marey of the phenomena of flight in birds and insects, as illustrated by apparatus devised by him, which actually traced on paper the curve described by the point of the wing in flying. The professor, during the disturbances caused by the late war in France, was steadily occupied in continuing his researches, and presented to the Academy of Sciences, some months since, a continuation of his series of communications, in which he discusses the movement which the action of the wing produces upon the body of the bird itself. He shows that the progression of the bird when flying, in consequence of the beating of its wings, takes place along an undulating line, the sinuosities of which are produced by the slight leaps of the animal. These movements can in certain cases be appreciated by the eye, as when

watching the movement of gulls following a vessel at sea, and regulating their motion by the speed of the vessel. It is very difficult, however, according to Mr. Marey, to ascertain to what movement of the wing these displacements of the body of the bird correspond; and the determination of the periodical variation of the quickness in the movement forward of the bird is impossible by means of our senses. To accomplish this object, the author has added to his previous apparatus an arrangement for noting and recording these movements with absolute precision; and from a critical study of the indications, he comes to the conclusion that, on registering simultaneously both the vertical oscillations of the bird and the movements of the wing, it will be found that each revolution of the wing is accompanied by two complete oscillations of the bird—one of these coinciding with the depression of the wing, and the other with its elevation. He also finds, from the investigation bestowed upon the indications of the instrument, that in depressing its wings the bird is raised, to fall again at the end of this period of depression, while at the same time the bird accelerates its horizontal velocity. In raising the wing the bird rises anew, again to fall back, and in the second period it loses much of its horizontal velocity; and this latter fact gives the clew to the mechanism of the second ascension, showing that this ascent is made at the expense of the velocity acquired by a mechanism analogous to that of the boy's kite, which, moving against the air, and presenting against it an inclined plane, is elevated at the expense of the horizontal force applied to it. The experiments of the author have satisfied him that this second ascent is wanting when the bird at the end of its flight has not acquired a velocity at the expense of which it can be produced.

In a subsequent notice Mr. Marey promises to exhibit the result of attempts made by him to reproduce synthetically the mechanism of flight; that is to say, for the purpose of realizing by means of a weighty apparatus the effect of sustainment in the air, and of the horizontal forward motion which the bird obtains by the action of its wings.—6 *B*, XIV., 661.

RED COLOR OF TOURACO.

Much interest was excited some time ago by the announcement of the occurrence of a peculiar red coloring matter, containing copper, and soluble in water, on the wings of the touraco (*Musophaga*), a large species of African bird well known to naturalists. M. Jules Verreaux, the ornithologist, has lately given an account of these birds as observed by him in their native localities, in the course of which he remarks that his attention was first attracted to the soluble nature of the touraco red in endeavoring to catch a wounded bird during a rain. To his surprise, on grasping it, there was left on the palm of his hand a peculiar matter of a blood-red color, which, however, disappeared on washing. He then found that the red of the wing, under such circumstances, was washed out, and the feathers became almost white; but that, as soon as the bird became perfectly dry, the red color immediately reappeared. This experiment was repeated, on the same bird, several times a day indefinitely, and always with the same result. M. Verreaux also remarks that he has observed a similar fact in regard to a species of Old-World trogon, although it is not known whether the American representatives of the group have the same peculiarity.—11 *A, Jan.* 3, 1871, 40.

PIRATICAL HABITS OF SOUTH AMERICAN GULL.

Instances are abundant where one bird secures its food by plundering another, and depriving it of prey just captured, thus being able to live itself in idleness upon the labors of its victim. Illustrations of this are seen in the treatment of the fish-hawk by the bald eagle, the impositions practiced by the jagers upon the gulls and terns, the theft of the celery-grass roots by the bald-pated ducks from the canvas-backs, etc. An interesting communication from Mr. Hudson, of Buenos Ayres, to the Zoological Society of London, in reference to the habits of the *Larus cirrhocephalus*, a South American species of gull, informs us that this species, like the gulls about Salt Lake, is in the habit of congregating in large numbers in the cultivated fields, following the plowmen, and devouring the locusts, or other insects so abundant in that country, which are turned up by the plow. At a certain season of the

year the ground is filled with the larvæ of the giant beetle, which throws up little mounds of earth, these being often so numerous as to give the plains, where the grass is very closely cropped, the appearance of being covered with mud. These insects are picked out in great numbers by flocks of the South American lapwing, or plover (*Vanellus cayennensis*), upon which the gulls, not being endowed with a probing bill, wait assiduously, each plover having its attendant gull quietly standing by it. At the instant when one of these larvæ is extracted, and is seen in the bill of the plover, the gull darts with sudden fury upon it, and a chase ensues, the robber following closely, and screaming all the time until the prize is dropped. The flight of the gull is then instantly checked, and, hovering a moment to watch the fall of the worm, he drops suddenly upon it, and, swallowing it greedily, he returns to resume his position, and again watch by the side of his victim. This same species of gull is in the habit of frequenting the slaughter-grounds near the city, and mingling among the cattle and the men, without manifesting the slightest fear, ready at any time to pick up the clotted blood and entrails, and yet seldom, if ever, receiving a speck to stain its pure white breast.—11 *A*, *Jan.* 3, 1871, 6.

EXTINCTION OF THE MOA.

The question of the antiquity of remains of giant birds found in New Zealand, and known among the natives as the moa, received a few years ago an additional zest by the discovery of a skeleton containing portions of the ligaments, skin, and feathers still attached. This forms one of the treasures of the museum at York, and was found in the interior of the province of Otago.

Dr. Hector, in a communication to *Nature*, announces the discovery of a second specimen of the same character, being the cervical vertebra of the moa, apparently of the very largest size, upon the posterior aspect of which the skin, partially covered with feathers, is still attached by the shriveled muscles and ligaments. He also informs us that all the facts connected with the discovery of this moa in New Zealand tend to show that their extermination was due largely to human agencies, and that there seemed to be a special class of natives, known as moa-hunters, who were occupied in their pur-

suit. Numerous localities have been discovered where the bones of the moa remain in immense profusion, all more or less mutilated, split, or charred, as the result of human agency, and usually accompanied by native implements of stone, some of which are of great perfection of finish. In addition, however, to the destruction of these birds by the natives, another cause that tended to their extermination has doubtless come into play, namely, that of the forest fires that so frequently occur in New Zealand and elsewhere. On numerous occasions, masses of moa bones, belonging to large numbers of skeletons, have been found in localities where the birds seemed to have been hemmed in so as to be unable to escape. These places consist mainly of spurs of the hills, jutting to a considerable distance out into the lakes, where it is probable the birds congregated to escape the flames, which, by approaching near them, destroyed them by suffocation, in consequence of their unwillingness to enter the water. Dr. Hector himself found at the southwest extremity of a triangular plain, by the side of the Wakatipu Lake, no less than thirty-seven of such skeleton heaps, situated precisely as just indicated.—12 *A*, *July* 6, 188.

DISCOVERY OF FOOT-PRINTS OF THE MOA.

It is announced in *Nature* that foot-prints of the moa have lately been detected in a new district in the province of Auckland, near the settlement of Gisborne, Poverty Bay. The slabs in which the impressions were found were about five feet below a deposit of salt and alluvium, which had been washed away by the action of the water, leaving visible the stone in which the foot-prints were found very plainly indented, and following each other in regular succession. The length of the foot-mark, from the heel to the tip of the centre toe, was nearly eight inches; the length of the stride twenty inches from heel to heel.—12 *A*, *August* 24, 324.

HABIT OF HORNED TOAD.

At the January meeting of the Zoological Society in London, a communication was presented from Mr. John Wallace upon a hitherto unobserved peculiarity of the horned toad, or *Phrynosoma*, of California. This animal, according to his statement, under certain circumstances (apparently as a mode

of self-protection) squirts out from one of its eyes a jet of bright red liquid very much like blood. This he observed three times in as many different individuals, although others did not present any peculiarity. They generally use this means of defense when first captured, the liquid being squirted a distance of six inches in one instance. This statement, if it be really a fact, has, as far as we know, no confirmation by any corresponding observation on the part of any of our American naturalists, and we commend the consideration of it to such as reside where this animal can be obtained. The species is not indicated, but the observations were made in the vicinity of Stockton, California.—11 *A*, *January* 3, 1871, 1.

SYSTEMATIC POSITION OF PTERODACTYLS.

The precise position of the pterodactyls, or the so-called fossil or flying dragons, has been a subject of much discussion among palæontologists, some referring them to the reptiles, and others to the birds, while others, again, have considered them as belonging to a distinct type of creation intermediate between the two. Professor Seeley, of Cambridge, who has recently given the subject a very critical examination, sums up the evidence by saying that the pterodactyls had a nervous system of the bird type; they had a kind of brain which exists only in association with a four-celled heart and hot blood, which it would necessarily produce; and with that respiratory organization is always associated a brain of the type that the pterodactyl is found to possess. Therefore he concludes that the general plan of the most important of the soft structures was similar to that of living birds. He finds, however, that these characteristics are associated with such a diversity of other details as to vindicate the propriety of placing them in a new group, of equal value with birds, and called *Ornithosauria.*—5 *A*, *July*, 1870, 293.

WEIGHT OF ALLIGATORS.

We announced some time ago the desire of Professor Phillips, of Oxford, to obtain the ratio of the weight to the length of living alligators and crocodiles, as stated in *Land and Water*. This journal has since presented several responses to the query, and from one of them we learn that a North Amer-

ican alligator of 8 feet 6 inches in length weighed 135 pounds, while one of 2 feet 3 inches weighed only 2½ pounds.—2 *A*, *December* 17, 1870, 445.

STRUCTURE OF MOSASAURUS.

In the *American Journal of Science* for June, Professor O. C. Marsh, of Yale College, has an article on some new fossil reptiles discovered by the Yale party last summer in the Rocky Mountain region. The cretaceous fossils described are of great importance, as they prove conclusively that the mosasauroid reptiles had a well-developed pelvic arch and posterior limbs, although up to the present time no satisfactory evidence of this had been discovered, and the eminent palæontologists who have recently made this group an especial study considered them probably destitute of these appendages. Some of the species discovered by Professor Marsh were much more attenuated than any hitherto described. One of them, which is named *Clidastes wymani*, was about thirty feet in length, and had the terminal caudal vertebræ less than one twelfth of an inch in transverse diameter.

In the same paper are notices of several new species of tertiary crocodiles from Wyoming, which were discovered in the same ancient lake basin as the serpents and lizards already described by Professor Marsh.

NEW FOSSIL LAND LIZARDS.

At a recent meeting of the Philadelphia Academy of Sciences, Professor Marsh, of Yale College, described several new species of fossil land lizards which were discovered in the tertiary deposits of Wyoming by the Yale scientific party during their explorations last summer in the Rocky Mountain region. Some of these lizards were as large as any now living in tropical America, but all were quite distinct from any hitherto found. They represent a new genus, which was called *Glyptosaurus*, in allusion to the fact that the head and parts of the body were covered with highly ornamented bony plates. Four species were described, which are readily distinguished by the form and ornamentation of the shields on the head. The largest of these, *G. sylvestris*, was about four feet in length; the smallest, *G. anceps*, apparently about two feet. The other species were intermediate in size, and were called

G. nodosus and *G. ocellatus.* These interesting remains will be described in full by Professor Marsh in an early number of the *American Journal of Science.*

SCARCITY OF POISONOUS SERPENTS IN TROPICAL AMERICA.

We are in the habit of supposing that tropical lands are necessarily infested with poisonous serpents of varied species and in great numbers, and are led to consider this supposed condition as one of the chief drawbacks to residence or travel in those regions. This may be the case as it regards Asia, and also in a few of the West India Islands, but it certainly does not apply to Central America, where, with an immense multiplicity of species, those of a venomous nature are comparatively rare; in fact, much scarcer than in the Southern United States. A naturalist, relating his recent experiences in Guatemala, which is a fair type of the region generally in this respect, remarks that one may be in the country a long time without seeing a snake of any kind, and much less frequently a poisonous one. The latter indeed are, perhaps, not actually rare on the coast, but they avoid the presence of man, and, at any rate, move about but little in the daytime. A species of rattlesnake is the most abundant. The writer also remarks that the poison of the rattlesnake appears to be much less deadly than it is farther north, as quite a number of cases of bites came under his notice, but he never heard of one resulting in death.—17 *C, December*, 1870, 443.

POISON SERPENTS IN INDIA.

It was stated some time ago by one of the India papers that a great many deaths were occurring in that country from the bites of poisonous serpents, and statistics were given on this subject which were discredited by various writers. We learn, however, by official records, that the number of persons who have died from this cause may be safely estimated at 40,000 per annum. The low condition of the treasury is given as the reason which prevents the government from renewing its former offer of reward for killing these serpents. A list of the bounties paid for destroying this class of noxious animals in a very small district showed that poisonous serpents were brought in at the rate of 1200 a day, and in the course of a couple of months the payments, at the

rate of from six to twelve cents each, amounted to $50,000. —12 *A*, *February* 16, 312.

EXTIRPATION OF SERPENTS IN THE WEST INDIES.

The great abundance of poisonous serpents in Santa Lucia and other adjacent West India Islands has given rise to inquiries as to methods of exterminating them, on account of their having become a serious impediment to the proper cultivation of the island and to the reclamation of the wild lands of the interior. Among other means suggested for this purpose is the introduction of the mungoose, the secretary-bird of Africa, and the kingfisher of Australia. Specimens of the first-named animal have been forwarded to Saint Lucia for the purpose of trying the experiment; and reports of encounters between the mungoose and serpents have been since noted, in all of which the former invariably came off successful. In several instances the animal appeared to have been bitten in its encounter, but with no injurious result.

It is probable, as already suggested by several persons, that the object in view would be completely attained within a reasonable time by allowing hogs to run wild and multiply in the islands. Their powers in destroying rattlesnakes in North America are well known, and it is not at all unlikely that they would be as effective in the West Indies, although, from the great abundance of serpents, quite a long time might be needed before any appreciable effect would be manifest.—11 *A*, *January* 3, 1871, 1.

POISONOUS SERPENTS IN AUSTRALIA.

Although the number of poisonous serpents in North America is sufficiently great to render it a matter of considerable uncertainty to the unlearned whether any given individual is likely to prove dangerous or not, we may congratulate ourselves at being better off than the Australians. In the recently published catalogue of the serpents of that country by Dr. Krefft, of Sydney, we find enumerated about eighty-three species, of which only twenty-three are non-venomous. Of the sixty poisonous kinds fifteen are sea snakes, which are frequently encountered when bathing. The total number of serpents catalogued as occurring in America, north of Mexico, is about one hundred and fifty, of which only

twenty-three are in any way poisonous.—15 *A*, *August* 6, 1870, 179.

POISON GLAND OF AN EAST INDIAN SERPENT.

We are most of us familiar with the structure of the poison glands in the American serpents, as illustrated in the rattlesnake and copperhead. These, as is well known, lie on each side of the head, and give to it a peculiar breadth as compared with the narrow neck, and show unmistakably the venomous nature of any given specimen. In a certain form of East Indian serpent, however, the *Callophis intestinalis*, these glands extend from the head for about one third of the entire length of the body, lying free in their cavity, and causing the heart to occupy a place greatly posterior to its usual position in other species of snakes.—12 *A*, *July* 28, 265.

TURTLES OF NORTHERN AND SOUTHERN AMERICA.

In a lecture upon "The Origin of Species," by Professor Cope, delivered at Germantown, he remarked upon the differences between the turtles of the northern and southern hemispheres. These are mainly that the under side of the shell, in the southern forms, has eleven plates, while that of the northern has but ten. The northern turtle withdraws its head between the two shells by bending its vertebral column, but the southern throws its head around one side under the shell, much as a bird buries its head under its wing. In the turtle of the southern hemisphere both bones of the pelvis are united to the lower shell by a vertebral brace; in the northern, they are entirely separated. These are the strong characteristics of the two varieties; but in the upper bed of the mesozoic age, in the green sands of New Jersey, turtles are found which have some of the characteristics of those of the southern hemisphere. In these, however, the bones of the pelvis are not joined to the lower shell, but there are slight projections on the shell immediately under the pelvis which nearly approach a junction.—*Cope's Lecture.*

FROGS IN NEW ZEALAND.

The adaptation of certain animals to conditions of existence apparently different from those considered necessary to the preservation of life has frequently been noted, and a curi-

ous instance of this has come to light in regard to a kind of frog found in New Zealand. We can hardly imagine a frog surviving and maintaining its existence in a country habitually parched with drought, involving the disappearance of every drop of surface moisture, but it is said to be really the fact that in districts often over five thousand square miles in extent in the interior of New Zealand, where there is no surface water for months, and in some instances for years, whenever rain falls in sufficient quantities to fill the water-holes, they immediately swarm with frogs; this, too, when previously one may dig for ten or twelve feet without finding the slightest moisture, much less any water, the whole ground being baked dry, and without any apparent signs of animal life. The problem, however, has been solved by a late writer, who states that on one occasion, while making a two days' journey on horseback without finding water, he became very much alarmed at the prospect, and called to his counsels a young native not more than ten years old, who, on learning the difficulty, proceeded to examine the dry surface of the water-holes, and finally detected and followed up an indistinct and crooked mark on what had once been mud to where it ceased in the shade of a small salt-bush. He then began to dig with a sharp stick, and in a short time turned out a ball of clay about eight inches in diameter, quite dry outside, which, when broken, disclosed a frog shut up in a cavity, containing, besides, more than half a pint of clear cool water. With this hint the writer afterward proceeded to dig out many other balls of a similar character, drinking the water and eating the frogs. It is thought not improbable that, in many cases, frogs may remain under such circumstances for several years.—2 *A*, *November* 12, 350.

EFFECT ON THE FROG OF THE REMOVAL OF THE BRAIN.

Some account has appeared in the public journals of the experiments of Professor Goltz, of Königsberg, upon the functions of the nervous system of the frog. This gentleman, having removed the brain of the frog with as little effusion of blood as possible, found that it would rest upon a table exactly in its natural position, as if in perfect life, without exhibiting the least indication of the wound which it had experienced, but without changing its situation of its own accord.

If pressed or pinched it moved by turning or leaping, but remained motionless in its new attitude. In the condition referred to it did not croak spontaneously, but this could easily be induced by rubbing the back gently with the moistened finger, which seemed to produce a croak or grunt of satisfaction. The equilibrium of the body was readily maintained by the mutilated frogs. When placed upon a book which sloped gradually, they would crawl to the upper edge, and rest and hug themselves to it with their fore feet, this manœuvre being repeated every time that the inclination of the slope was changed. A healthy frog, in a like case, would of course have immediately leaped to the ground. The movements of a frog deprived of the brain differ from those of a healthy frog in being executed mechanically, and with a constant regularity. It is inferred from these interesting experiments that the nervous centres of voice, and the power of keeping the equilibrium, reside not in the brain, but in the cerebro-spinal axis.—3 *B*, *July* 21, 525.

NEW SPECIES OF SIEBOLDIA IN CHINA.

The interesting announcement has been made to the Academy of Sciences in Paris of the discovery in Western China of a new species of giant salamander (*Sieboldia davidiana*), closely resembling in general character the well-known species of Japan, but differing in several important points. These consist principally in the less confluent character of the tubercles on the surface of the head and anterior portion of the body, and their greater degree of regularity, forming regular lines, with well-marked figures. The eye is inclosed in a double range of tubercles, which, on the internal face, become angular like a very open V, while in the Japanese species the tubercles present only a confused arrangement. The Chinese animal, too, appears to have the fingers and toes a little longer in proportion, and the general color of the body darker. It lives on the frontier of the Celestial Empire, in the clear and limpid waters which descend from the mountains of the Khou-kou-noor, where it reaches enormous dimensions, some specimens having been met with weighing from fifty to seventy pounds.—3 *B*, 12, *July* 20, 662.

CATALOGUE OF FISHES IN THE BRITISH MUSEUM.

A work of great importance to naturalists has been completed in the publication of the eighth and last volume of the catalogue of fishes in the British Museum, prepared by Dr. Günther, one of its assistants. Although nominally a catalogue of this particular collection, it is actually a complete system of the fishes, and furnishes by far the most convenient manual of general inquiry in this department of science, although, of course, not superseding the still larger work of Cuvier and Valenciennes. In summing up the amount of material at his command during the preparation of the work, Dr. Günther remarks that he has had under his inspection in the British Museum over 29,000 specimens, embracing a little over 5000 species. Allowing about 1600 species as valid, not at present contained in the Museum, and admitting the existence of others described but not known to him, he estimates the total number of fishes at present described as about 9000. In this connection we may, perhaps, be pardoned for reminding our readers that, great as is the collection of fishes in the British Museum (the largest in Europe), it is exceeded by far by that in the magnificent Museum of Comparative Zoology, of which Professor Agassiz is the honored director, and of which (as well as of its head) all Americans are so justly proud. The Thayer Expedition to Brazil alone furnished a much larger number of specimens of fishes than has just been enumerated, while by actual count less than one half the Museum collection of fishes already arranged occupies over 15,000 jars, each containing from one to hundreds of specimens.—12 *A*, *March* 2, 343.

BRITISH MUSEUM FISHES.

In the work by Dr. Günther upon the fishes of the British Museum, to which we have just alluded, reference is made to the neglect in Great Britain of the opportunity of scientific research furnished by the cruises of the British vessels of war, and invidious comparisons are made between this line of conduct by them on the one hand, and that of the German, Russian, and United States governments on the other. During the early years of the present century very important contributions were made to the British Museum by such par-

ties as those of the Beagle, the Erebus and Terror, the Sulphur, the Samarang, the Herald and Plover, the arctic expeditions, etc., which, however, according to Dr. Günther, have of late found no imitators. At the present time the British Museum depends for its additions—in the department of zoology especially—upon purchases made from private parties with funds granted annually by Parliament, while other national establishments rely mainly upon the efforts of collectors officially attached to government vessels, who bring in copious material, and of much greater novelty and scientific interest.—19 *A*, *March* 18, 256.

CONFUSION OF NAMES OF FISHES.

A writer in *Land and Water* expresses great astonishment at reading of the capture of a horse-mackerel near Newport, Rhode Island, weighing five hundred pounds, and remarks that he has never seen a fish of this species in England weighing more than six pounds. We have here another instance of the confusion arising from the paucity of English names for objects of natural history, to which we have already referred. The fish in question was unquestionably the same as that called the tunny in Europe, a species attaining an enormous size, sometimes considerably exceeding that just mentioned. To what is called bluefish in New York, and whitefish on the lower Hudson, is applied, on some parts of the coast of New Jersey, this same name of horse-mackerel, while on other portions of the coast of the same state it goes by the names of skipjack and snap-mackerel, and it is known as tailor in Maryland and on the Southern coast.—2 *A*, *Aug.* 6, 1870, 88.

SPAWNING OF HERRING.

According to a writer in *Land and Water*, the female herring discharges her spawn in midwater simultaneously with the emission of milt by the males, and the fertilized eggs sink immediately to the bottom, where they adhere closely to any object with which they come in contact, in consequence of a mucus which envelops each globule. Fishermen maintain that when a large school of herring are engaged in this operation the water of the sea becomes whitened by the milt, sometimes recognizable over a large area; and it is said to be necessary to wash the nets thoroughly and with

great care to prevent them from becoming heated and rotten in consequence of having been soaked in this animal matter. —2 *A*, *December* 10, 1870, 425.

THE FOOD OF THE SEA-HERRING.

Of the various fishes that inhabit the ocean, none have, perhaps, more direct bearing upon the prosperity of the maritime people of the North than the sea-herring, the shores of both hemispheres being visited regularly by countless myriads, that furnish an inexhaustible source of food. It is, therefore, not to be wondered at that the attention of fishermen, as well as of statesmen and political economists, has been directed to the different questions connected with the migration and preservation of these fish, and that much research should have been expended in determining the various points connected with their history.

Until quite recently, however, one important element of their biography has been unsolved—namely, the precise nature of the food upon which they subsist, at least during the time when they come into the vicinity of the shore, although their varying degree of excellence throughout the year is believed to depend largely upon what they find to eat in the different months.

Intimately connected with this same subject of the food of the herring is the fact that at times it is found almost impossible to preserve the fish after being caught, since, notwithstanding the prompt use of salt, decomposition ensues, and spoils the entire catch. Indeed, at certain seasons of the year, it is said that herring can not be preserved at all except by taking the precaution of retaining them alive in the net for a period of from three to ten days.

A very important communication on the food of the herring has lately been published by a Danish author, Mr. Axel Boeck, from which we learn that the herring food or "meat," consisting almost entirely of minute invertebrate animals, is divided by the Northern fishermen into three classes—the "red," the "yellow," and the "black;" the names being derived from the color of this food when living, or else from its appearance when in the stomach of the fish.

The "red meat" (*rödaat*) is the most common and best known, and occurs along the entire coast of Norway and in

the mouths of the bays, but more sparingly in the bays themselves and in the open sea, diminishing in amount, apparently, with the depth. At certain periods of summer, however, it appears in such immense abundance that the sea is colored red by it. When floating in this way upon the surface it attracts innumerable schools of mackerel as well as of herring, which are then much less shy than usual, and the scene is one of impressive activity, owing to the number of boats and nets employed in fishing. On a careful examination, this substance was found to consist almost entirely of small copepod crustaceans, the largest scarcely the thirtieth of an inch in length, and barely distinguishable by the naked eye. They were mostly species of *Calanus*, *Eikocalanus*, *Centropages*, and *Anomalocera*.

It can hardly be believed that such minute and almost microscopic animals can be of so much importance to the welfare of a nation; but, in reality, the mackerel and the autumnal herring owe their fatness to them, the microscope revealing through their thin shells the fat lying in distinct strips between the muscles and intestines.

These same crustaceans occur also off Spitzbergen in such abundance as to furnish food to innumerable water-fowl, and even the whales feed upon them to a great extent. If, now, the herring has taken in a large quantity of this red food, and is then captured and killed without its having been fully digested, the animal matter in the stomach of the fish begins to spoil before it can be reached by the salt, and the stomach thus becomes putrid, as well as the large blood-vessel which lies under the back, the coloring matter imparting a reddish tinge to the flesh along the backbone. For this reason it is required by law to keep herring three days in the nets in water, that all the contents of the stomach may be completely digested, while the fish is prevented from taking in a fresh supply. Sometimes, however, the winds drift this herring-food into the nets, and furnish to the herring an opportunity which they eagerly embrace, rendering them again liable to the difficulty just mentioned.

When a herring, on being squeezed, discharges a yellow pulp, this is known as "yellow meat," or *gulaat*. This is not so abundant as the other, but appears, like the "red meat," to be composed in part of transparent copepods, together

with the larvæ of the tape-worms and other annelids, which occur on the Norwegian coast in immense numbers. It is stated that the surface of the sea is sometimes seen to be completely covered with little worms of about the twenty-fourth of an inch in length, swimming actively about by means of certain hairs which encircle their bodies like a girdle. These animals were sufficiently developed to permit their identification as the young of *Leucodore ciliata*. Herring and mackerel feed largely upon these animals, so that the "yellow meat" consists in greater part of the fine hairs which cover the exterior of the larvæ in question. This kind of food is considered to interfere less with the proper curing of the herring, as it is much more quickly digested.

The most objectionable kind of herring-food, however, is that which is known as the "black meat," or *svartaat*, sometimes called *krutaat*, and occurring on the surface of the sea in the form of little granules moving freely about, but which sink on being touched. This is said to be most abundant in rainy seasons, when there is a short interval of fine and clear weather. Herring that have fed on this substance are considered to be entirely unfit for salting, even when kept in the nets for a much longer time than that already mentioned. The salted fish has an extremely disagreeable smell, even after the stomach, with its contents, has been removed.

A microscopic examination of this matter showed that it consists entirely of the larval young of small shell-fish found among the sea-weed, and belonging to the genus *Rissoa*. These swim by means of two flippers covered with hairs, which are protruded from a transparent shell having from three to seven turns or windings. They are about one tenth of an inch in length, and on being touched draw within the shell and sink to the bottom. When full grown these mollusks lose their flippers, and creep about the sea-weed by means of a large foot. Thus it is easy to understand why this "black meat" is more dangerous than the other kinds. While the shells of the animals forming the "red meat" are quite thin, and the bodies of the "yellow meat" are very soft, those of the "black meat," on the contrary, being inclosed in hard shells, are not so easily reached by the digestive fluid; so that while the exterior parts, namely, the swimming flippers, are quickly digested, the rest of the body within the

shell becomes decomposed. On this account the flesh of the herring, after feeding upon these mollusks, soon becomes tainted by their decomposition, and gives out a disagreeable smell, notwithstanding the application of salt.

It may be asked why the summer and autumnal herring feed upon this food, and not the spring herring nor those taken in the open sea, both the latter being capable of preservation without any detention in the nets. The reason of this seems to be that the spring and open-sea herring are captured when under the stimulus of the spawning season, and in the search for a suitable place for the development of their young. At this time the question of food is reduced to zero, or near it, and a careful examination of the stomachs of herring taken under such circumstances shows comparatively little animal matter. Summer and autumnal herring, on the other hand, are specially engaged in seeking for food and bringing up their flesh, and that at a time when the larvæ of the lower animals are found swimming freely about in large quantity upon the surface of the sea.—*Die Natur*, 1869, XLVII., XLVIII.

PHOSPHORESCENCE OF DEAD FISH.

According to Panceri, the phosphorescent substance in dead fish is of a fatty character, and due to slow oxidation in contact with air. Phosphorescence generally, it is said, shows itself some time after death, and continues until putrefaction commences. As soon as a true decomposition sets in, accompanied by the disengagement of ammonia, phosphorescence ceases, while it is prevented by the presence of fresh water, alcohol, or carbolic acid, but is facilitated by oxygen.—12 *A*, *Aug.* 10, 287.

FISHES OF CUBA.

A recent number of the Annals of the New York Lyceum of Natural History contains an elaborate paper, by Professor Poey, the well-known naturalist of Havana, upon the genera of the percoid fishes found in the West Indian seas, especially in the waters around Cuba.

FRESH-WATER FISHES OF ALGERIA.

In a communication by Colonel Playfair upon the "Hydrographical System and the Fresh-water Fish of Algeria," he

states that in the rivers flowing into the Mediterranean there are sixteen species of fish, only three of which were common to the whole region, one being the common eel. Eleven species were peculiar to the coast portion of Algeria, among them a small trout. The common goldfish, although very abundant, was not indigenous, and was scarcely entitled to be included. In the upper part of Sahara were found two species, and in the lower two others, found in the salt lakes, and frequently ejected by the Artesian wells.—12 *A*, *Aug.* 24, 333.

TAME CODFISH.

Mr. Buckland, in *Land and Water*, gives an interesting account of a visit paid by him to a pond containing tame codfish at Port Logan, Wigtonshire. The property in question belongs to a gentleman by the name of M'Dougall, and consists of an amphitheatre about one hundred feet in diameter hollowed out of the solid rock by the sea. All egress from this is prevented by a barrier of loose stones, through which water passes freely. On approaching the shore of the pond many codfish of great size were seen, and when a servant-woman who had charge of the fish approached with some mussels, the surface of the water was perfectly alive with the struggling fish. They came close to the edge, and after a little while permitted Mr. Buckland to take hold of them, scratch them on the back, and play with them in various ways. Among other experiments tried by him was that of holding a mussel in his hand, and allowing the fish to swallow his hand in the effort to obtain the mussel. These fish furnish to the proprietor an ample supply of excellent food, the flavor being considered much superior to that of the cod taken in the open sea. Whenever needed for the table, a selection can readily be made from the most promising of those at hand, and the fish secured without any difficulty.

Another writer in *Land and Water*, referring to this account of the codfish at Port Logan, remarks, that when he visited the pond fifty years ago, there was a blind codfish in the pool, which the woman who had the pond in charge used to feed with limpets taken from the rock. When this fish came to the surface with the others she caught it in her fingers, sat down with it upon a stool, having a pail of the limpets, shelled, in her lap, with which she fed it out of an iron

spoon, the fish seeming to enjoy it very much. After feeding she returned it to the pond. The writer avers this to be a fact, although he evidently scarcely expects it to be believed. —2 *A*, 1870, *November* 12, 348, *and November* 19, 360.

STONES IN THE STOMACH OF CODFISH.

Among the curious things connected with the codfish is the frequency with which large stones are found in the stomach. These are of various sizes, sometimes, in a large fish, weighing many pounds; and it is a popular belief among fishermen that these are taken in just before a storm for the purpose of anchoring themselves during the expected swell of the sea. This is supposed to be corroborated by the fact (if it be one) that all the fish taken before a storm agree in this peculiarity, whereas at ordinary times nothing of the kind can be detected.—2 *A*, *August* 12, 92.

TEETH OF THE STURGEON.

To those who are accustomed to consider our American sturgeon as a comparatively worthless fish (large numbers, indeed, when captured, being thrown away as of no value), it may be a matter of surprise to know that a small European species, the sterlet, is among the kinds of fish most highly esteemed in Russia. Efforts are now being made to introduce this species into Great Britain by transporting the ova, and about two hundred young fish have already been turned out on the estate of the Duke of Sutherland. A very interesting fact was observed during the development of these fish, namely, that immediately behind the lips of the sterlet, just escaped from the egg, were found eighteen pretty strong curved teeth, with which they fought each other quite ferociously.— 11 *A*, *January* 3, 1871, 11.

DEVELOPMENT OF THE LAMPREY.

A memoir presented to the Academy of Sciences of St. Petersburg by Mr. Owsjannikow, on the development of the river lamprey (*Petromyzon fluviatilis*), confirms the observations previously made in regard to *Ammocoetes*, being the larval stage of the same fish. As is well known, this latter form was for a long time considered a distinct genus of the lampreys, maintaining, as it did, to the age of two or three years,

its distinctive peculiarities. The chief of these is the difference in the shape of the mouth, which, instead of being a very concave disk, thickly studded inside with sharp spines, is composed of one thin semicircular lip, with a transverse one behind it.—*Mel. Biol. Acad. Sci. St. Petersb.*, 1870, 189.

LÜTKEN ON GANOID FISHES.

Dr. C. Lütken, in a paper on the limits and classification of the ganoid fishes, published in the *Annals and Magazine of Natural History*, as translated by Mr. Dallas, discusses at considerable length the true affinities of this remarkable group of fishes, of which, as is well known, the garfish, or garpike of America, and the *Polypterus* of Africa, are types, constituting living representatives of a form which, in the earlier geological periods, was the predominant one.

The conclusion to which Dr. Lütken arrives, in answer to the question "What is a ganoid?" is as follows: Every fish (abdominal, malacopterygian, physostome) with osseous scales, articulated (as in the lepidostei) or interlocked (in the manner of the pycnodonts), or with gular plates in place of the branchiostegal rays, and with the paired fins fringed and scaly (as in the polypteri), or which combine several of these characters, should be classed among the ganoids.—10 *A*, *May*, 1871, 337.

GOURAMI FISH.

The gourami, an Eastern fish recommended for stocking fresh-water ponds, is by no means difficult to transport, having been successfully carried from the Mauritius to China. Quite recently twenty or thirty small ones were taken from Mauritius as far as the Isthmus of Suez, the water in which they were placed having been changed every day. On reaching their destination they were placed in a fresh-water canal, where they are thriving. This fish is said to breed readily, commencing in the second year, and attaining in time a weight of eight or ten pounds, although considered best when weighing only about four pounds.

A NEW LOPHIOID FISH.

Dr. Lütken, in describing a new genus of fish belonging to the *Lophius* group, remarked that one character distinguish-

ing it, both peculiar and suggestive, consisted in the curious development of the head of the first dorsal fin-ray, which, with its tentacles, pigmental spots, etc., gave the impression of, as it were, a mimicry of the head of a Nereis or worm. The best known representative of the Lophioid fishes is the uncouth species known in different regions under the names of fishing-frog, goosefish, bellows-fish, etc. This has a long filament just on the top of the head, terminating in a brush, and is said to answer the purpose of enticing small fishes into the vicinity of the owner, when the body is concealed from view in the mud. The bunch in question on this new genus and species (*Oneiroides*) is thought to be an attractive bait of the same character.—12 *A*, *August* 24, 333.

PECULIARITIES OF SALMON KELTS.

Mr. Buckland, in *Land and Water*, calls attention to the fact that in certain male salmon kelts examined by him early in February, the skin of the fish, in which the scales are pocketed, is abnormally thickened, so as almost to obliterate the appearance of the scales, and cause the fish to appear as if destitute of them. The female kelts, however, did not exhibit this phenomenon, the scales being in them little if at all altered either in the color or thickening of the scale-pockets.—2 *A*, *February* 4, 1871, 87.

SALMON-FISHING IN LOCH TAY.

Mr. Frank Buckland, in *Land and Water*, gives an account of a visit to what he considers the finest salmon-fishing ground in Scotland—namely, Loch Tay. This patch of water is about fifteen miles long and one mile wide, very deep, and filled with water of the utmost purity and of very low temperature. In this lake the salmon sometimes make their appearance as early as December, although fishing does not begin until the month of February, the purity of the water and the abundance of food being supposed to induce these fish to come up from the sea at a much earlier period than usual; but it is not until the following November, or ten months later, that the reproductive season begins. The average weight of the fish is given at about twenty pounds, while those of twenty-five to thirty are by no means uncommon.

In another article Mr. Buckland comments upon a female

salmon taken early in January of the present year. The eggs at the time of capture were in an advanced stage of development, forming two solid masses, and weighing together not less than three and a half pounds. Allowing from eight to nine thousand eggs to the pound, this fish had not less than nineteen thousand eggs in all. These were of a rich coral color, and very loose in their membrane. The fish itself weighed twenty pounds, and measured three feet two inches in length.

In reply to an inquiry whether this fish was in season, Mr. Buckland determined that it was decidedly the contrary, as December or January is entirely too late for fishing in any English river.—2 *A, January* 7, 5.

"LANDLOCKED SALMON."

Among objects of great interest to American sportsmen, and those prosecuting inquiries in regard to the food-fishes of the country, are the so-called "landlocked salmon," found in Maine and elsewhere, and about which there has been much diversity of opinion. These are known especially as inhabiting Sebago Lake and its streams, some tributaries of the Penobscot, the lakes in the neighborhood of Ellsworth, and the Schoodic lakes at the head of a branch of the St. Croix River. This fish has been actually described as a distinct species—from Sebago Lake, as *Salmo sebago;* and from near Ellsworth, Maine, as *S. gloveri;* the Schoodic fish being, we believe, without any specific appellation, unless it be *S. hardinii* of Dr. Günther, or, according to Agassiz, *S. eriox*, both European species.

Whether this fish be really a "landlocked salmon"—that is to say, a true sea salmon that has changed its habits to such an extent as to dwell permanently in the fresh waters—is the subject of inquiry on the part of Mr. Livingstone Stone, who is rather inclined to take ground in favor of a specific difference. He finds, as might be supposed, that there is no reason for referring the landlocked salmon, whether of three varieties or of only one, to the brook trout, the difference in the size of the scales, the dark spots instead of red, the shape of the head, and many other points, being such as to distinguish them. On the other hand, the close relationship to the sea salmon is shown in the character of the scales and spots

just referred to, in the development of a conical tusk in the lower jaw, in the similarity of the parrs to the salmon parrs of the same size, and the great size of the eggs, equal in this respect to those of the salmon; in the form of the yolk sac, which is elongated like that of the salmon, instead of being rounded like that of the trout; in their ascending streams at night; in the short period of spawning; and in spawning at night and lying quiet during the day, the reverse being the habit of the trout, which spawns during the day and lies quiet at night. The relation is, therefore, much more close to the true salmon; and the remaining question is as to whether it be really the same as the true sea salmon or not. Mr. Stone, however, thinks the difference in the number of eggs of the Sebago salmon, as he calls it, and that of the sea salmon, is a very important point. Thus, while the latter produces from nine to fifteen thousand eggs per season, or an average of about one thousand to each pound in weight of the fish, the landlocked salmon, although of about one third the weight, averages only six hundred eggs per season, or about two hundred to the pound. Furthermore, there is not now, nor has there ever been, any thing to prevent these so-called "landlocked salmon" from going to the sea whenever they preferred; and the fact that they do not migrate is considered by Mr. Stone as strong proof that they never possessed the instinct to do so.—2 *A*, *April* 8, 1871, 245.

FOOD FOR YOUNG TROUT.

According to Dr. Slack, the well-known proprietor of the Troutdale fish-breeding establishment in New Jersey, the best substance with which to feed embryo trout hatched out artificially consists of beef's heart, prepared by first being opened that the coagulated blood may be washed away thoroughly, and then using only the pure muscular fibre. This is to be finely chopped into minute fragments, so as almost to form a pulp, and then, mixed with a little water, it is to be washed through a fine sieve of twenty-four threads to the inch, so as to prevent any minute particles from passing through.

TAILLESS TROUT IN SCOTLAND.

At the last meeting of the British Association some so-called tailless trout were exhibited, which were said to occur

in considerable numbers in a certain loch in Scotland, about a thousand feet above the level of the sea, and about one acre in extent. It is so shallow that a man can wade through it, and has a stony bottom, with a few weeds. Although surrounded by other lochs, the tailless trout were found exclusively in the one in question. The precise nature of the mutilation was not given in the article.

It was stated, in the discussion which ensued upon the exhibition of this specimen, that in other localities in Great Britain there were streams in which trout without tails, and sometimes without other fins, were not uncommon.—18 *A*, *August* 18, 537.

INSECTS IN HAILSTONES.

During a recent meeting of the Entomological Society of London an insect known as *Chlorops lineata* was exhibited, which had been found frozen up in the centre of a hailstone, proving that it must have been flying at a very considerable height in order to have been inclosed in the mass of ice.—3 *C*, *April* 29, 1870, 360.

PECULIARITIES OF MADEIRAN ENTOMOLOGY.

The entomology of the island of Madeira, according to Mr. Wollaston, presents some very peculiar features as compared with that of the main land, this being especially the case in regard to the coleoptera. From a review by Mr. Wallace, in *Nature*, of the paper of Mr. Wollaston, we learn that the most striking facts indicated are: first, the affinity of the Madeiran with the Mediterranean fauna; second, the total absence of certain large divisions of coleoptera abundant in that fauna; third, the number of new and peculiar species and new and anomalous genera; and, fourth, the unexampled preponderance of apterous species. This characteristic is exhibited very strikingly by the fact that species are apterous in Madeira which are winged elsewhere; also, that genera usually winged embrace apterous species only in Madeira; and, again, by the presence of peculiar or endemic apterous genera, some of which have winged allies, while others belong to groups wholly apterous. This shows, evidently, according to Mr. Wallace, that there is something in Madeira which tends to render wings rudimentary, and Mr. Wollaston himself sug-

gests that it is connected with exposure to a stormy atmosphere. He observes, further, that many of the winged species have wings more developed than usual; and Mr. Darwin, applying his peculiar views of selection to the case, gives as the explanation that the act of flying exposes the insects to be blown out to sea and destroyed, and those that flew least lived the longest, and by that process the race became apterous. On the other hand, with species to which flight was a necessity, the strongest-winged lived the longest, and thus their wings became more and more developed in each successive generation.—12 *A*, *March*, 30, 435.

SELECTION OF INSECTS FOR FOOD BY BIRDS.

Although we look, and with ample reason, to the birds as the main agency in destroying insects injurious to vegetation, observation shows that different forms of insects are molested by them in very different degrees. This is especially the case in regard to the *Lepidoptera*, some forms of which are not touched by any birds whatever, and others, again, are devoured by some and spared by others. As a general rule, it is said that the most beautiful and brilliantly colored *Lepidoptera* owe their safety to their tints, as the bird first attacks the most striking portion, namely, the red hinder wing, and the insect tears itself away and escapes. Hairy caterpillars, again, are less eaten than the smooth species, not only, perhaps, on account of their bristly covering, but their more nauseous taste. The streaked caterpillars, spotted with yellow, are usually refused, while all the smooth and dark kinds, especially those resembling plants in color, or of a reddish tint, are generally devoured with great avidity.—1 *C*, XXIII., 368.

TEMPERATURE OF INSECTS.

The delicate indications in regard to temperature furnished by the thermo-electric apparatus have been lately used to great advantage in many investigations having for their object the determination of minute quantities of heat. Some of these we have already presented to our readers, and we have now to chronicle some new experiments with the apparatus, for the purpose of ascertaining the amount of heat possessed by invertebrate animals, in continuation of the re-

searches of Dutrochet, Dubost, Newport, and others. The observations in question were made by Mr. Maurice Girard, with both the thermo-electric pile and the mercurial thermometer. From an abstract of the results obtained we learn that in the larvæ and pupæ of insects with a complete metamorphosis, especially caterpillars with smooth bodies, the temperature of the surface descends below that of the surrounding air, showing that the evolution of heat by the respiratory combustion may be insufficient to compensate for the loss due to the superficial evaporation or cutaneous transpiration. In the case of chrysalids, the cocoon, in which the pupæ of many lepidoptera and hymenoptera envelop themselves, seems specially intended, among other objects, to prevent too rapid a drying of the animal, such as would induce a fatal superficial refrigeration. Indeed, at the moment of being taken out of the cocoon, pupæ usually present a distinct elevation of temperature, but, exposed to the air, they lose weight by evaporation, and the surface temperature of their bodies often descends below that of the surrounding air. When the temperature approaches nearly to 32° Fahr., a superficial cooling, due to evaporation, does not appear to be produced.

Adult insects, even when sleeping or very weak, always have their temperature either equal to or slightly above that of the air. The larvæ and pupæ of insects with incomplete metamorphosis resemble adults in this respect. Mr. Girard also ascertained that the temperature varies appreciably in different regions of the body, especially in insects with powerful aerial locomotion, where the difference in heat between the thorax and abdomen in this respect may be very considerable. In the bumble-bees and in the sphingidæ the excess of the thoracic over the abdominal temperature sometimes amounts to from 7° to 18° Fahr., the heat in the flying insect being concentrated in the thorax with an intensity proportioned to the power of flight. This appears to result from the fact that in the thorax are situated the strong muscles both of the legs and wings, which in energetic contraction during flight become the seat of an active combustion.

Again, in the bumble-bees and some other insects the external evolution of heat was found to be in relation to the buzzing, the temperature falling as soon as the buzzing ceases,

and rising again as soon as it is resumed, this being observed many times successively.—10 *A*, *October*, 1870, 352.

FUNGUS GROWTH ON INSECTS.

It is a comfort to know that insects, while developing to such an extent as to produce very serious injury and destruction to our interests, are themselves liable to attacks which in time may destroy them, or render them comparatively innocuous. Among the most important of these agencies may be mentioned certain species of fungi, which occasionally attack insects like an epidemic. One of these, the mycelium of an *Empusa*, came to the rescue during a time when the forests of Pomerania and Posen were threatened with total destruction by caterpillars. After a time it was found that the caterpillars were swollen to bursting, white threads appearing between the rings of the body, and ultimately causing their death in such quantities as to save the forests from further injury. The same parasite also attacks the common house-fly, as well as the dung-fly, so as to almost annihilate them in certain districts. The only order of insects not subject to the attack of the *Empusa* is said to be that of the *Neuroptera*, while even amphibia and fishes occasionally experience its disturbing influences.—5 *A*, *July*, 1870, 293.

NEW PARASITE ON THE ELEPHANT.

In the June number of Hardwicke's *Science Gossip*, a new form of parasite, named *Idolocoris*, is described, which is found adherent to the naked skin of the elephant of Ceylon. It belongs to the order of Hemiptera, and is characterized by Mr. Walker, of the British Museum, as forming the type of an entirely new family.—4 *A*, *June*, 131.

PARTHENOGENESIS IN DIPTERA.

A curious instance of parthenogenesis in *Chironomus*, a genus of diptera, is mentioned in the Memoirs of the Academy of Sciences of St. Petersburg. In spring, the larvæ, produced in the ordinary way from eggs, grow rapidly, and after the third change of skin attain their full size, showing distinct traces of the pupa within them. After the pupa stage has been perfected the eggs are produced direct from it. In the autumn the course of development during the preparatory

changes is precisely the same. The pupa, however, then changes into the perfect insect, which deposits eggs, probably after copulation, in the usual manner.—13 *A*, *October* 22, 14.

HABIT OF REDUVIUS.

Mr. Meehan, of Philadelphia, reports a curious fact in the natural history of a well-known bug, the *Reduvius novenarius*. He had previously mentioned his discovery that this insect stored up turpentine in its body, but for what purpose he was then unable to ascertain. He has since discovered that it is used for fastening its eggs to the branches of trees, and sticking them together, and also, in all probability, as a means of protection against enemies and the weather. The eggs of this insect were inserted in groups, and each one set upright, one against another, with the turpentine, like the cells of the honeycomb. He does not think that this matter is a secretion of the insect itself, but believes it to be simply turpentine gathered up and stored away.—2 *D*, 1871, 50.

NAIL-NIBBLING PROPENSITIES OF THE COCKROACH.

Dr. M'Leod, the well-known editor of the *Sunday Magazine*, in an account of his adventures during a recent trip to India, denies the nail-nibbling propensities of the cockroach, possibly because he himself had not suffered from their attacks. His assertion, however, has met with a rejoinder from a correspondent of *Nature*, who writes that a friend had requested him to state that while passing from Kurrachee to Bombay, by sea, he was annoyed one night in his berth by some insect crawling upon his face, and, half asleep, half awake, he put up his hand and sent the insect to the foot of his berth. Shortly afterward he was awakened by a pain at his great toe, and, looking at it, he discovered that the cockroach had nibbled off all the nail down to the quick.—12 *A*, *November* 10, 27.

RELATIONSHIPS OF PHYLLOXERA.

Among the insects most destructive to the vine, although but recently noticed, is a form known as the *Phylloxera vastatrix*, or vine-root louse, which has lately excited much attention in France from the amount of injury it bids fair to cause to the vineyards. This is found in the ground about

the roots of the vine, on the leaves of which another form of louse has been observed considerably different in character. It has lately been announced that the two insects are in reality of the same species, and that the terrestrial form emerges ultimately from the soil provided with wings, and is carried by the wind upon the vine-leaves, where it deposits its eggs. From these proceed numerous insects, which produce certain excrescences in the leaves, resembling the gall-nut, and these give birth to living young, which, in turn, repeat the operation for a number of generations, until the leaves begin to fall toward the end of September. At this time the insects descend to the roots and establish themselves there. An important hint is thus furnished to the agriculturist in regard to getting rid of the new pest—namely, to carefully collect and destroy the vine-leaves containing any form of nut-gall excrescences. The insect itself is believed to have been brought to Europe from America, and to occur in this country abundantly, although referred to under a different name. —2 *A*, *August* 13, 105.

NEW CATERPILLAR DISEASE.

In a late paper by Dr. Cohn, of Breslau, upon a new disease affecting certain caterpillars, during which the skin turns black, a coal-black pigment appears in the blood, and the caterpillar becomes a wrinkled and brittle mummy, he ascribes the phenomenon to the development of a fungus which he calls *Tarichium*, and which has a strong relationship to *Empusa*.—12 *A*, *Jan.* 26, 243.

NEW INVERTEBRATE FOSSILS.

A recent number of the Proceedings of the Academy of Natural Sciences, Philadelphia, contains a paper by Professor Meek upon various new species of invertebrate fossils from the carboniferous and Devonian rocks of Ohio, based upon specimens obtained during the Ohio Geological Survey under the direction of Prof. J. S. Newberry.—2 *D*, 1871, 51.

SUPPOSED NEW BRACHIOPOD.

Professor King, in the *Annals and Magazine of Natural History*, describes a supposed new genus of Terebratulæ which was dredged in very deep water on the Agulhas

Banks, off the coast of Africa, and described as *Agulhasia davidsoni.* Mr. Dall, of the Smithsonian Institution, who has been making a special study of the brachiopods, finds reason to believe that this animal is not a new form, but simply an embryonic or immature stage of the genus *Terebratulina.*—13 *A, Feb.* 15, 140.

WORK ON EUROPEAN MOLLUSCA.

Mr. Gwyn Jeffreys, well known for his book on British shells, and for his connection with the recent deep-sea dredgings of the British Commission, announces a work on the mollusca of the European seas. This will, it is hoped, furnish especially the means for a satisfactory comparison of the fauna of that part of the world with that of the Atlantic coast of North America—a field which has been explored with so much thoroughness by Dr. Stimpson, Professor Verrill, Count Pourtalès, and other American naturalists.—15 *A, October* 15, 504.

COLORS OF FOSSIL SHELLS.

In an inquiry into the possibility of determining the original colors of fossil shells, by Kayser, it was found that reds were more durable than any other color, this tint being appreciable in forms where their nearest living allies were of somewhat similar shades.—19 *C, August* 5, 252.

TRANSVERSELY STRIATED MUSCULAR FIBRE IN MOLLUSCA.

Transversely striated fibre is universal in the voluntary muscles of vertebrates, insects, and crustaceans. In the other departments of invertebrates it is very rare, and seems usually associated with muscles performing rapid voluntary motions. Among the mollusks it has been known in a few species of the classes of *Tunicata*, *Brachiopoda*, *Polyzoa*, and *Conchifera* respectively. Mr. W. H. Dall has recently discovered transversely striated muscle in the genus *Acmæa*, belonging to the class *Gasteropoda*, so that there remains but one class among the mollusca, the *Cephalopoda*, in which it is yet unknown. This is, strangely enough, the most highly organized of any of the groups of the subkingdom mollusca. Similar muscles are found in a few worms, and in a species of sea-anemone, or *Actinia*.

INJECTION OF CRINOIDS WITH SILICA.

As bearing upon certain questions connected with the true condition of *Eozoon*, Dr. Dawson, of Montreal, calls attention to the occurrence of crinoids and other unmistakable fossils, with their pores or cavities filled with a silicious substance which completely penetrates their most delicate structures, and which proves on examination to be a hydrosilicate allied to jollyte.—12 *A*, *June* 29, 163.

RARE ECHINUS.

In an appendix to a report published by the Museum of Comparative Zoology on the echini eollected by Pourtalès, mention is made by Mr. Alexander Agassiz of an interesting species of this group, obtained during the Coast Survey exploration of the Gulf Stream in 1868 and 1869. This, at the time the preliminary report was written, could not be identified by Mr. Agassiz; but he has since then been able to ascertain that they belong to a genus named *Kerioaphorus*, the type of which had been drawn up on a fishing-line from a depth of about seven hundred feet. It is peculiar on account of its long curved spines, which resemble the antennæ of a certain family of beetles.

BRYOZOA AND PARASITIC CRUSTACEA.

Professor Claparède has made some interesting communications to the Society of Physics of Geneva upon certain marine invertebrates. One of these has reference to the *Bryozoa*, a group of animals found in fresh water and salt, and resembling polyps in living in associations, but which are distinguished from them in their external characters, and especially in the absence of any radiated structure. He has investigated this group with special reference to the relations which exist between the different individuals of the same association—relations of nutrition by the intermediation of pores which permit the passage of the nutritious liquid from one individual to another, and the nervous relations established by a colonial nervous system, as already pointed out some years ago by Mr. Fritz Miller. On different points of the group of individuals there are frequently found fixed bodies called *Avicularia*, which M. Claparède considers as rudi-

mentary individuals, their object appearing to be that of attracting and retaining the animalcules which serve as food to the *Bryozoa*. All the individuals of any one colony are not active, some of them, indeed, seeming as if dead, and actually having been so considered. This, however, is an error, these individuals, although having lost most of their organs, yet preserving the branches of the colonial nervous system, and continuing to live at the expense of the juices elaborated by the active members of the society. M. Claparède has shown the mode of retrogressive metamorphosis of these animals, which retrace their steps over the same route of development which they had traversed in their first growth.

In a second paper upon parasitic crustaceans of the annelids M. Claparède shows that of eleven species hitherto known, all belong to the order of copepods, although constituting eight or nine genera, divided into very different families. Among these copepods some are free, and others are parasitic; in others the female sex is completely parasitic, the males being free; while, again, the male, very much reduced in volume, lives as a parasite upon its female, which itself is a parasite of some other animal.

M. Claparède, in the critical study of the annelids collected by the British deep-sea expeditions—some of them taken at a depth of 650 fathoms—has shown that these animals are very largely the same, generically, with the kinds found nearer the surface of the sea, and even along the shores. Contrary to the opinion of M. Quatrefages, he has ascertained that lumbricoid worms are very common at great depths, and that this group consequently contains species indubitably marine.—*Mém. Soc. Phys. Genève*, XXII., 1870, 556.

INFLUENCE OF SALT AND FRESH WATER ON CRUSTACEA, ETC.

Professor Plateau has published some investigations as to the effect of placing fresh-water articulates in salt water, and salt-water articulates in fresh, the observations having been directed more particularly to the crustaceans. Among the conclusions arrived at are, that sea water has but a slight influence upon the aquatic coleoptera and hemiptera in the perfect state, but that it produces injurious effects upon fresh-water articulates with a delicate skin, or furnished with branchiæ. Among crustaceans some species of *Gammarus*

and *Asellus* resist the action of sea water for several hours, while others perish in a few minutes. The fresh-water articulates that can live with impunity in sea water are those in which no absorption of salt takes place by the skin; those which die in it in a comparatively short time having absorbed chlorides of sodium and magnesium, which the experimenter found to be the most injurious salts, the sulphates having no special effect. When the fresh-water articulates pass, by a slow transition, from fresh to sea water, and reproduction has taken place during this transition, the new generation resist the action of the sea water longer than the ordinary individuals of the species.

In the investigations upon the marine crustacea of the Belgian coast the conclusions arrived at were, first, that the commonest species die in fresh water after the lapse of a variable time, which, however, does not exceed nine hours; second, that the marine crustacea, when immersed in fresh water, give up to this the salts, especially the chloride of sodium, with which their tissues were impregnated. The converse of this observation was also true, that the fresh-water articulates immersed in sea water absorb these salts; third, that in most cases the presence of chloride of sodium forms one of the indispensable conditions of resistance for the marine crustacea; but this salt appears to be the only one necessary; fourth, the smaller individuals, and those which, having just moulted, have the integuments delicate, present less resistance than the others to the influence of liquids of exceptional composition; fifth, the difference between the densities of sea water and fresh water can not be regarded as the cause of the death of marine crustacea in fresh water.

As a general conclusion, applicable to both groups, Professor Plateau states that the idea of endosmose enables us to explain the absorption of salts by the delicate skin or the branchial surfaces of fresh-water articulates when immersed in sea water. The fact that diffusion and dialysis take place with more energy in the case of the chlorides of sodium and magnesium than in that of sulphate of magnesia explains why it is that the chlorides of sea water are alone absorbed. Dialysis explains why marine crustacea, when placed in fresh water, lose the salts with which they were impregnated.—10 *A, May*, 1871, 362: *from Mém. Acad. de Belgique.*

FEET IN A TRILOBITE.

Much interest was excited some time ago by the announcement on the part of Mr. E. Billings, of Montreal, of the discovery of a specimen of trilobite which, in his opinion, exhibited unmistakably the possession of legs, and thus solved what was considered an interesting problem in the economy of that animal. Professor Dana, however, assisted by Professor Verrill, has made a critical examination of the original specimen of Mr. Billings, and both came decidedly to the conclusion that these organs are not legs, but the arches in the membrane of the ventral surface, to which the foliaceous appendages of the abdomen were attached. Professor Dana calls attention to the fact that similar arches exist in the under surface of the abdomen of the macrourous crustaceans, to which the abdominal appendages are articulated. From a careful examination of the subject, Professor Dana concludes that, with the exception of these arches, the under surface of the belly of the trilobite must have been delicately membranous, like that of the abdomen of the lobster and other long-tailed crabs.

NEW FOSSIL CRUSTACEANS.

According to Mr. Woodward, twenty-three new species of fossil crustaceans have been discovered and described within the last year, one of them, of a very extensive distribution, occurring in Upper Silesia, in Turin, and in three distinct localities of England. He gives in his adhesion to the views of Mr. Billings in regard to the possession of feet by trilobites, and thinks that this fact, if established, would carry the isopod class back in time to the earliest palæozoic rocks. He dissents from the views of Dr. Packard, who, from the examination of their embryos, proposes to bring the king-crab, or common horseshoe-crab of the United States, near to the trilobites.—15 *A*, *August* 12, 210.

CLEANING DIATOMS.

An improved method of cleaning and bleaching diatomaceæ is stated by Dr. Maddox to consist in dissolving forty grains of crushed chlorate of potassa in water, with the addition of one and a half drams of hydrochloric acid, the whole

to be placed in a three-ounce vial, and closed with a wax cork. The diatoms are to be immersed in this for a suitable length of time, and subsequently washed out with clean water.

COCCOLITHS OF VEGETABLE, NOT ANIMAL ORIGIN.

The question of how the lowest forms of animal life which abound in the deep sea obtain their food where no vegetable life is present has long presented great difficulties to naturalists. Mr. H. J. Carter, in a paper in the "Annals and Magazine of Natural History," cuts the Gordian knot by the hypothesis that the coccoliths and coccospheres found in such enormous numbers in deep-sea dredgings, and recently identified by Gümbel and others as entering largely into the composition of some very ancient rocks, are not, as held by Professor Huxley and others, animals of low organization, but are referable in fact to the vegetable kingdom. His conclusion has not, however, been generally accepted by naturalists.

HERMIT CRABS CLIMBING TREES.

Most of our readers accustomed to the sea are familiar with the so-called hermit crabs, and their habit of taking possession of dead univalve shells, into which they retreat when disturbed, and which they carry around with them from place to place. In the United States these crabs are seldom of large size, on our Northern coast the largest finding their homes in the winkle or *Pyrula;* but in the East Indies they occupy still larger abodes, and are said to be in the habit of climbing stunted trees and devouring the eggs and young of the gannets and frigate pelicans.—2 *A*, 1870, *August* 10, 133.

EOZOON NOT OF ORGANIC CHARACTER.

In a communication to *Nature*, Mr. John B. Perry, of the Museum of Comparative Zoology in Cambridge, ranges himself among the number of those who oppose the theory of the organic origin of the *Eozoon canadense*, as maintained by Dr. William B. Carpenter, Dr. Dawson, of Montreal, etc. In reference to the so-called eozoon limestone in Chelmsford, Massachusetts, Mr. Perry states that this is not a sedimentary rock, but that it occupied pockets or oven-shaped cavities

once plainly overarched by gneiss, and that it is foliated, there being a regular succession of leaf-like layers from the walls toward the centres of the cavities, witness to which is borne by a like succession of different minerals; that in some places it ramifies through the surrounding rock in a vein-like way, while in others it exactly conforms with the most abrupt irregularities of the surface; that in one locality which he had repeatedly examined it conforms with the uneven portions of a mass of syenite, with which it is so associated as to reveal its more recent origin; and that, therefore, it is not of nummulitic derivation, but was deposited in a vein-like form, the materials having been probably forced up into the cavities from below while in a vaporous state.—12 *A, May* 11, 28.

PELOBIUS, A NEW FRESH-WATER RHIZOPOD.

Of the discoveries in natural history within the past few years, scarcely any are considered of greater importance than that of Professor Huxley, of the occurrence, in the depth of the ocean, of a living, organized mass of an animal nature, termed *Bathybius*, its relationships to other forms of animal life, both recent and fossil, having proved to be of the highest interest. This has recently been supplemented by the discovery, on the part of Dr. Greeff, of a somewhat similar substance existing in fresh water, which he characterizes as a shell-less fresh-water rhizopod, remarkable for its gigantic stature in comparison with all previous-known organisms of the kind. This substance, which he calls *Pelobius* (a name which *Nature*, from which we borrow this account, states to have long been preoccupied), occurs in many standing waters with a muddy bottom, especially such as have continued in that state for a long time without having dried up. This substance never disappears from these waters, but remains throughout the year, great masses appearing sometimes in one place and sometimes in another, in their external form presenting the appearance of more or less spherical lumps, varying from one or two millimetres in diameter down to the most minute points, scarcely perceptible by the naked eye. These are said to be so densely filled with mud particles, diatomaceæ, etc., that by transmitted light they can scarcely be distinguished from the actual mud without experience and careful examination; they may, consequently, be compared

to a living mud. By direct light, on the other hand, they appear as grayish-white, yellowish, or brownish bodies. Their movements consist in an amœboid and often lively creeping, by means of processes which are usually broad and lobate, during which the transparent body-substance often protrudes at the margins in elevations and undulations. This fundamental substance of the body consists of a hyaline protoplasm of irregularly frothy or vesicular consistency, containing, besides the above-mentioned ingested particles, a great number of very peculiar elementary particles. Among these there may be distinguished round or roundish oval nucleiform bodies and fine bacilliform structures. Of the former by far the greater number consist of shining pale bodies without any special structural characters, but of great firmness, and presenting considerable resistance to reagents (acetic acid and caustic potash). These bodies may possibly be correlated with the coccoliths, etc., of *Bathybius*. Besides these, however, there are less numerous roundish nuclei of softer consistency, and with more or less finely granular contents, which, from their whole nature, must undoubtedly be regarded as equivalent to the ordinary cell-nuclei.

Hence, in spite of its great simplicity in other respects, *Pelobius* represents a pluricellular organism, and is not to be referred to the so-called monera, like *Bathybius haeckelii*, according to the investigations of Huxley and Haeckel. Nevertheless, in connection with its possible relationship to *Bathybius*, it must be noticed that the cell-nuclei of *Pelobius* may occur in very variable quantity, often in so small a number as almost to disappear altogether; and farther, that they can be detected only in the perfectly fresh state. This latter statement applies also to the frothy vesicular arrangement of the body-substance, which disappears immediately after death or the application of reagents.

The second kind of the chief elementary parts of *Pelobius* consists of fine, clear, shining bacilli, which are scattered through the whole body, and likewise present great resistance to the action of acetic acid and caustic potash. These were mentioned by Dr. Greeff in a former publication, when he expressed the opinion that they originate in certain nuclei, which, however, he has since seen reason to doubt.

We are promised farther details in regard to this substance,

as much yet remains to be done for its proper elucidation.—12 *A*, *May* 18, 50.

CATTLE-PLAGUE ENTOZOA IN CEYLON.

In the course of an examination of the muscles of animals dying at Ceylon of the cattle-plague disease of that country, Mr. Boyd Morse discovered certain remarkable organisms, of which he has lately published an account in the London Microscopical Journal. He suggests the inquiry as to their relationship to the entozoa, described by Dr. Lionel Beale as found in the muscles of animals dying of the same disease, and thinks they may be their ova. They lie loose among the muscular fibres of the heart, sometimes in great numbers and at other times singly. There are several characteristic forms, all well figured in the article referred to.—*Quart. Jour. Mic. Soc.*, *December* 1, 1870, 312.

RICHARDSON'S HYPOTHESIS OF A NERVOUS ETHER.

In a late number of the Popular Science Review Dr. Richardson again brings forward his favorite theory in regard to a nervous ether, namely, that between the molecules of the animal matter, solid or fluid, of which the nervous organisms, and, indeed, of which all the organic parts of the body are composed, there exists a fine, subtile medium, vaporous or gaseous, which holds the molecules in a condition for motion upon each other, and for arrangement and rearrangement of form; a medium by and through which all motion is conveyed, and by and through which the one organ or part of the body is held in communion with the other parts, and by and through which the outer living world communicates with the living man; a medium which, being present, enables the phenomena of life to be demonstrated, and which, being universally absent, leaves the body dead—that is, in such condition that it can not, by any phenomenon of motion, prove itself to be alive.

According to the doctor, the evidence in favor of the existence of an elastic medium pervading the nervous matter, and capable of being influenced by simple pressure, is perfectly satisfactory. Numerous experimental facts suggest that there exists in the nerves an actual material mobile agent—a something more than the solid matter which the eye can see and

the finger touch. He therefore is led to believe that there is another form of matter present during life, which exists in the condition of vapor or gas, which pervades the whole personal organism, surrounds, as an enveloping atmosphere, each molecule of nervous structure, and is the medium of all motion communicated to or from the nervous centres.

The source of this refined matter in the body he considers to be the blood, and he looks upon it as a vapor distilled from the blood, as being persistently formed, so long as the blood circulates at the natural temperature, and as being diffused into the nervous matter, to which it gives quality for every function performed by the nervous organization. In the closed cavities, containing nervous structure, the cavities of the skull and spinal column, this gaseous matter, or ether, as he terms it, sustains a given requisite tension; in all parts of the nervous structure it surrounds the molecules of nervous matter, separates them from each other, and yet is between them a bond and medium of communication.

In estimating and defining the physical properties of this nervous ether he suggests that it is a gas or vapor, having in its elementary construction carbon, hydrogen, and possibly nitrogen. He thinks that it is condensable under cold, movable under pressure, diffusible by heat, insoluble in the blood, and holding, at the natural temperature of the body, a tension requisite for natural function. In his opinion it is retained for a longer time after death in cold-blooded than in warm-blooded animals, and longer in warm-blooded animals that have died in cold than in those that have died in heat.

It is not, according to his idea of it, in itself active, nor an excitant of animal motion in the sense of a force, but it is essential as supplying the conditions by which the motion is rendered possible; as serving as a conductor of all vibrations of heat, light, sound, electrical action, and of mechanical friction. It holds the nervous system throughout in perfect tension during perfect states of life. By exercise it is disposed of, and when the demand for it is greater than the supply, its deficiency is indicated by nervous collapse or exhaustion. It accumulates in the nervous centres during sleep, bringing them to their due tone, and thus rousing the muscles to awakening or renewed life. The body, fully renewed by it, presents capacity for motion, fullness of form, and life. The

body, bereft of it, presents inertia, the configuration of "shrunk death," the evidence of having lost something physical that was in it when it lived.—5 *A*, *October*, 1871, 379.

INFLUENCE OF HEAT ON THE HUMAN BODY.

Dr. Craig, of the Medical Service of the United States Army, prosecuted some experiments during the hot summer of 1870, as published in the American Journal of Science, in reference to the influence of external physical conditions upon the temperature of the human body. The highest bodily temperature observed by him during that time was 99.7° Fahr. He states that below 99° he did not feel uncomfortably hot; but when 99.2° was reached, then the sensation of suffering from heat came on. By the prolonged use of the shower-bath he was able to reduce his temperature to 97.7° in the hottest weather, which constituted a very great amelioration of his sensations. He concluded that the discomfort we feel in hot weather is not from the heat on the surface, but from the secondary effect of heating the whole body. Should the internal heat of the body be raised above 100°, he thinks that apoplexy and sun-stroke would be quite likely to supervene. Judging from some experiments recorded elsewhere, Dr. Craig thinks that a reduction of the temperature as low as 88° Fahr., by external application of cold, is as great as it is safe to venture upon.—4 *D*, *November*, 1871, 330.

EFFECT OF HEAT ON ANIMALS.

Professor Bernard, of Paris, has lately published a report of a series of experiments instituted by him in regard to the effect of heat upon animals, in the course of which he shows that in all cases exposure to high temperature produces an increase in the rapidity of the action of the heart; that the animal's breathing becomes hurried; and that, after a certain period, which is more quickly attained in birds than in mammals, the heart, if the temperature be sufficiently high, stops suddenly, the whole temperature of the animal being at the same time raised several degrees above its standard temperature.

On placing a bird or rabbit in the cage used for the experiments, the air of which was about 150° Fahr., and dry, anxiety was quickly manifested, the respirations became tumultu-

ous, and death speedily ensued (in four minutes for the bird, and in twenty for the rabbit).

The temperature in the rectum rose from 104° to 122° Fahr. (bird), or 115° F. (rabbit), and the heart in both animals was absolutely quiescent, while cadaveric rigidity was established with extraordinary rapidity, and the arteries as well as the veins contained black blood. The professor also verified the experiments of Bichat in reference to the behavior of the muscles of organic life and the striated muscles in regard to temperature, showing that the former are actually more sensitive than the thermometer to slight variations of heat, any increase of temperature actually calling forth peristaltic movements in the intestines of a rabbit which had become quiescent after exposure to the surrounding air. This action is direct, and is not communicated through the nervous system.

The exciting action of heat, of course, has a limit, and this is shown in the case of an animal exposed to a gradually rising temperature by the heart beating faster and faster, till at length it stops, dead, with complete loss of irritability. The cause of this cessation is, as Professor Bernard thinks, partly chemical, and due to the coagulation of the santonin or myelin; though, when life is prolonged for several days, other causes, as yet undetermined, and affording a field for investigation, co-operate.—13 *A*, *September* 15, 1871, 441.

EFFECT OF DIMINISHED PRESSURE ON ANIMALS.

In a memoir by Bert upon the influence exercised upon vital phenomena by variations in barometrical pressure, it is stated that if the atmospheric pressure to which a warm-blooded vertebrate is exposed be suddenly reduced to fifteen or eighteen centimetres of the barometrical scale, the animal jumps about convulsively, is attacked with cramps, and dies very quickly, with bloody foam in the bronchia. Death occurs with equal suddenness whenever the receiver under which the animal is placed is closed, or is cut off from the external atmosphere. In the first case the surrounding air is scarcely changed, but in both cases the blood in the left cavity of the heart is dark.

On the other hand, should the pressure be diminished gradually, and the air be continually renewed in the apparatus, the animal can be kept alive for a long time. Should the

receiver be closed, however, the animal dies with asphyxia. The composition of the air in which animals die varies with the pressure. Birds can be kept living when the pressure is reduced below eighteen centimetres. Mammals can sustain a reduction to twelve centimetres, but under these circumstances their temperature diminishes by several degrees.

Cold-blooded, and some new-born animals, can sustain a still greater diminution of pressure. The less the pressure at which the animal suffocates, the more oxygen and the less carbon are found in the remaining air. The animals which, at the same pressure of the atmosphere, leave most oxygen—that is, form least carbonic acid—are falcons, owls, and grown cats; then come the sparrows, and afterward frogs and new-born cats.—18 *C*, *August* 15, 1871, 517.

BERT ON THE INFLUENCE OF INCREASED ATMOSPHERIC PRESSURE.

We have already referred to the observations by M. Bert upon the effects produced upon animals by diminished atmospheric pressure, and we now have a report from him upon the phenomena presented when this pressure is increased. The animals experimented upon were sparrows, rats, and frogs, placed in a vessel of the capacity of one quart, in which about fifteen minutes were required to obtain a pressure of nine atmospheres. This increase, however rapidly produced, appeared to exercise scarcely any effect upon the animal, the respiration only becoming feeble at about the time when the phenomena peculiar to asphyxia commenced, the animal expiring with convulsions, with an internal temperature of 80° to 92° Fahrenheit—that is to say, scarcely above that of the surrounding air. After death, under a pressure greater than two atmospheres, very red blood was found not only in the arteries, but in the veins; and with a pressure above five atmospheres numerous bubbles of gas appeared in the right cavities of the heart, which were not disengaged by the return to the normal pressure. Sparrows could not bear with impunity a pressure of over seven or eight atmospheres, and in some instances, if the asphyxia was very decided, they seemed to perish suddenly by an abrupt decompression. In this case they were found to have free gas in the right side of the heart.—3 *B*, XIX., *September* 7, 1871, 524.

PECULIAR EFFECTS OF CURARE POISON.

In the course of some late experiments by Glase upon the effects of administering small quantities of curare in successive injections, it was ascertained that the animal becomes at each injection more and more sensitive to the poison, and finally reaches a state in which an extremely small quantity produces immediate convulsions, and even death. The injections may be intermitted for days, and yet the animal remain as sensitive as before. The author believes that the system becomes adapted to the poison in such a way as to absorb it more rapidly, and that an actual change in some of the nervous centres occurs. This can not be considered as a case of so-called cumulative poisoning, since the animal remains perfectly healthy between the doses.—12 *A*, *Sept.* 21, 1871, 403.

REFRIGERATION OF WARM-BLOODED ANIMALS.

In a series of experiments upon the refrigeration of warm-blooded animals by Dr. Horvath, a young dog was cooled to such a degree that the temperature in the rectum descended to 40° Fahrenheit; yet the animal, on the application of heat, revived, perfectly uninjured.

In another experiment, where the same region in a rabbit indicated 45°, and in a cat 49°, neither the action of the heat nor of the respiratory movement could be perceived. On the restoration of warmth by pouring warm water over these animals (which had remained for an hour in a state of apparent death), spontaneous contractions of the heart, which had ceased for an hour, were observed. The electrical current applied directly to the muscles induced energetic contractions in the same muscles which, before the warmth was applied, were insensible to the strongest electrical action. Another interesting and important fact was, that in an animal which was first refrigerated and then warmed, it was not possible to excite the action of the muscles of the skeleton by even the strongest electrical stimulus when applied to its nerves, while the same muscles, on the direct application of the current, contracted energetically. The fact that we can separate nervous and muscular energy from each other by this agency, which hitherto it has only been possible to do by the employment of curare, promises to be of good service in fu-

ture researches concerning the physiology of the muscular and nervous systems.—20 *A*, 1871, 355.

DEXTRAL PRE-EMINENCE.

Dr. William Ogle has recently made a communication to the Royal Medical and Chirurgical Society of London upon what he calls "dextral pre-eminence," in which he takes ground against the most generally accepted doctrine that the use of the right hand is based on conventional agreement, enforced by educational influence, without the existence of any natural tendency in physical formation. In support of his views he remarks that the preferential use of one side is not limited to the arm, but extends to the leg, which is not subjected to education like the arms. The tendency to use one side preferentially manifests itself before education begins, and often persists in spite of efforts made to overcome it. Left-handedness resembles many physical malformations in being hereditary, in running in families, and in attaching itself rather to the male sex than to the female. Statistics are given of its relatively frequent tendency in the two sexes. The author also gave an account of his observations in this matter upon other animals than man; monkeys and parrots especially showing that they also have a tendency to use one side preferentially.

Having shown that there must be some one or other structural foundation for right-handedness, he next considers what this may be, and states as the result of his inquiries that an actual structural difference has been detected in many cases between the two hemispheres of the brain, and that while the left is the more complex in right-handed individuals, the contrary is the case with those who are left-handed.

He also remarks that in most cases of the normal condition, namely, when the right-hand is used habitually, the left hemisphere of the brain is larger, in consequence of receiving a freer supply of blood than the right, the left arteries being, as a rule, slightly larger than the right ones; and independently of the size of the vessels, the stream of blood is less on the left side than the right. This explanation is corroborated, according to the author, by the peculiarities of the cerebral blood supply in those animals which manifest a tendency to use one side rather than the other, as in the case of

parrots.—*Proc. Royal Med. and Chir. Soc. London*, VI., 1871, VIII., 392.

MODE OF COPYING ROCK INSCRIPTIONS.

Among objects of great ethnological import are the aboriginal inscriptions or carvings upon rocks, which are met with in North America and elsewhere, and are sometimes of a very remarkable character. Ordinary copies of such inscriptions, unless they be photographs, are rarely of sufficient accuracy to be of much value; and those of our readers who are likely to come across such inscriptions may like to know a method by which an absolutely perfect fac-simile can be made. This process has been applied with much success in copying carvings in Egypt and other places, and it will be equally serviceable in our own country. For this purpose the inscription is to be first well cleaned from dust or mud by means of a hard, stiff brush; stout, unsized paper is then to be wetted rapidly, but uniformly, in a tub of water, and applied to the inscription, and forced into the irregularities by repeated and forcible strokes with a hard brush—an ordinary clothes-brush being as good as any for the purpose. If the stone be clear of dust the paper adheres, and, when dry, falls off, forming a perfect mould of the inscription. If the carving be deep or broad it is sometimes advisable to apply several sheets of paper, one after the other, brushing over the surface of one with glue or gum before applying the next, so as to obtain, when dry, a firm body. By making a plaster cast of the paper relief thus prepared, a fac-simile of the inscription will be obtained.—13 *A*, *May* 15, 1871, 275.

DECOMPOSITION OF ANIMAL SUBSTANCES CONTAINING PHOSPHORUS.

It has been a question whether vegetable and animal substances containing phosphorus give off phosphureted hydrogen when indicating putrefaction. If answered affirmatively, it would show either that phosphorus exists in the organism in some other form than that of phosphoric acid, or that, under the influence of putrefaction, reducing substances are formed of so energetic a nature that even phosphoric acid is deprived of its oxygen. It is difficult to conceive that either of these things could happen. In the animal organism ener-

getic processes of oxidation go on; hence lower degrees of oxidation can not arise, nor combinations of phosphorus with other elements, for such combinations would be quickly oxidized into phosphoric acid.

In special experiments in regard to this subject by Plosz, fishes were used as best adapted for the purpose, not only on account of the large proportion of lencithine which they contain, but also because it is probable that they contain another phosphorized body in the nuclei of their blood corpuscles. The fishes were beaten to a pulp, and laid aside with a little water, for putrefaction to set in. The external air was excluded, so that only that air which was contained in the flask could act as an oxygenant. A disengagement of gas quickly took place. The gas given off was conducted through a solution of silver nitrate, in which it produced a dark brown precipitate. The generation of gas ceased after some time, but was renewed as soon as air was admitted into the apparatus. In this manner four parallel experiments were made, and the whole precipitate formed during a period of five weeks was employed in the examination for phosphorus and sulphur. For this purpose the precipitate was acted upon with nitro-hydrochloric acid, every precaution being taken, and tested for sulphuric and phosphoric acids. Sulphuric acid was found in abundance, but no phosphoric acid could be detected.—21 *A*, *August*, 1871, 734.

DIFFERENCE OF BRAIN IN MAN AND OTHER MAMMALS.

Professor Theodore Meynert, in a late number of the Memoirs of the Anthropological Society of Vienna, presents an elaborate discussion of the differences in the structure of the brain of man from that of the other mammalia. His remarks are too technical for our columns, but the general conclusion arrived at is that differences exist which are of a fundamental character, and by which even the most closely allied anthropoid apes can be distinguished from man.

SMALL-POX IN THE NORTH.

By late advices from the extreme north of the continent, we learn that small-pox and measles have continued to make fearful ravages among the natives. Entire bands of Esquimaux, in the region between the mouths of the Mackenzie and

the Coppermine, have been exterminated by measles; and in a settlement of 500 half-breeds, near Fort Edmonton, on the Saskatchewan, 180 have already died of the small-pox, the disease being still in full activity.

ANCIENT PAINTINGS BY BUSHMEN.

Mr. Rupert Jones has lately published extracts from a letter written by a friend in South Africa, containing a reference to certain old paintings found upon the walls of caves, and made by the Bushmen. These pictures are said to be very varied, and to constitute a faithful representation of the manners, customs, modes of warfare, weapons, etc., of the race mentioned. Three different series of paintings were met with, one over the other; and as the most recent were believed to be upward of fifty years old, it was inferred that the undermost were very ancient. The colors are permanent, being derived from the ochreous concretions abounding in some of the sandstones of the interior of Africa, which, when broken open, are found to contain various shades of yellows, browns, reds, etc., the broken concretions themselves serving as paint-pots. The importance of copying these paintings, and rendering them available for ethnological investigations, is urged on account of the fact that the Caffres are constantly destroying them, so that in the course of a few years they will probably become entirely obliterated.—12 *A*, *Dec.* 8, 1870, 101.

ANCIENT CITY IN NEW MEXICO.

An examination has recently been made by an officer of the United States Army of an old pueblo situated about twenty-five miles from the town of Socorro, on the Rio Grande. The walls of the buildings of this pueblo are composed of thin sandstone, heaped one layer upon another, without mortar, and without any traces of beams or timber of any kind. The edifices seem to have been but one story high, and to have consisted of four separate buildings, arranged so as to form a hollow square, with a fifth a little outside of these. The longest range was over two hundred feet in length, and the whole five contained about two hundred rooms. Near the pueblo extensive silver mines have recently been discovered, and a town is to be laid out during the present year, the material for the houses to be derived from the ruins. There are

evidences of ancient workings of these mines in the form of shafts now entirely filled up with earth, although it is probable that these do not antedate the period of the occupation of the country by the Spaniards.

PRE-HISTORIC MODES OF SEPULTURE.

In a paper by Mr. Petrie on ancient modes of sepulture in the Orkneys, presented to the British Association, he states that sepulchral mounds were very frequent there, generally on elevations. The skeletons were often discovered in a sitting posture. Mr. Flower considered this an interesting announcement, as it had been observed in every country in Europe, as well as in Peru, India, and Africa. Herodotus, in his account of the *Autochthones*, a people who lived in the vicinity of what is now called Tunis, says that they always placed their dying friends in a sitting posture to await their last hour; and it seems that they so buried their dead. In referenee to this, it may be remarked that among the North American Indians it was generally customary to dig the graves on the southern slope of a hill, and to bury the dead in a sitting posture, with their faces toward the south.—12 *A*, *August* 24, 1871, 335.

PLATYCNEMIC SKELETONS IN THE DENBIGHSHIRE CAVES.

Mr. Boyd Dawkins, an expert in such matters, has lately discovered some interesting pre-historic caves, of the neolithic period, in Denbighshire, England. One of these extended horizontally into the rock, and was blocked up with earth and large masses of stone, and contained numerous broken bones of animals that had been eaten, such as the dog, fox, badger, horned sheep, Celtic short-horn, roe, stag, horse, wild boar, domestic hog, etc. With these were associated a number of polished stone instruments and scrapers, fragments of pottery, etc., and a number of human skeletons, which appeared to have been buried originally in a sitting posture, varying in age from infancy upward.

The most interesting peculiarity of these skeletons consisted in the fact of their possessing the peculiar flattened conditions of the forward portion of the shin now known as the platycnemic, and found in great development in our mound-builders, according to Professor Wyman. The cranial

capacity of these remains appears not to be inferior to that of civilized man of the present age, although the ridges and processes for muscles indicated a greater physical power.—12 *A*, *September* 14, 1871, 388.

EXPLORATION OF THE "GROTTO OF THE DEAD" IN FRANCE.

The committee appointed to explore the "Grotto of the Dead," near Alois, in France, report that from their latest researches, this cavern, so interesting in an ethnological point of view, seems to be a "fault," occupied originally by a vein of lead ore, and that this had been taken out, and the cavity subsequently utilized, first as a dwelling-place, and then as a place of sepulture for the race which has been found therein. Much interest is attached to the further exploration of this deposit.—1 *B*, *October* 22, 1871, 48.

ANTIQUITIES FROM PERU.

Mr. Harris has recently presented to the Anthropological Institute of London a collection of wood-carvings, pottery, and cotton rags from Macabi Island, off the coast of Peru. The rags extended over a bed of many hundred yards in area, with an average thickness of five feet, and below a deposit of several feet of guano. The wood and pottery were discovered at a depth, in the guano, of from fifteen to forty-five feet.—15 *A*, *July* 1, 1871, 21.

NEW DISTINCTION BETWEEN MEN AND ANIMALS.

At the late annual dinner of the Royal Academy of England, Professor Huxley, in returning thanks for the Royal Society, stated that he was at last able to present a tangible distinction between men and animals. The old differences so constantly relied upon have one by one proved to be unsatisfactory. Thus other species besides man walk on two legs, and have no feathers; caterpillars make themselves clothes, while kangaroos have pockets; the dog reasons and loves much as one's neighbors do; parrots, again, utter what deserves the name of sense as much as a great deal of that which it would be rude to call nonsense; and beavers and ants engineer as well as the members of the noblest of professions. After all, however, man alone can draw, or make unto himself a likeness. This, then, should be considered the

great distinction of humanity; and the most pre-eminently human of creatures are those that possess this distinction in the highest degree. Consequently the most eminent of the artists of the day is to be considered the highest specimen of mankind!—20 *A, May* 6, 1871, 517.

OSTEOLOGY OF THE MAMMALIA, AND SERIAL HOMOLOGY OF THE LIMBS.

The accomplished anatomist, Professor W. H. Flower, toward the end of last year published "An Introduction to the Osteology of the Mammalia, being the substance of the course of lectures delivered at the Royal College of Surgeons of England in 1870," which is one of the most valuable and satisfactory compendiums hitherto published. Combining in an eminent degree great anatomical knowledge, and that acute appreciation of relations which mark the systematic zoologist, he has produced a work which is addressed to both classes. Commencing with a summary of the classification of the mammalia, he makes known, in successive chapters, the general characters of the skeleton and vertebral column, and its modifications in the various orders, considering in separate chapters the cervical, the thoracic and lumbar, and the sacral and caudal vertebræ, as well as the sternum and the ribs, and in succeeding chapters the modifications, in the various orders, of the skull, the shoulder girdle, the fore limb, the pelvic girdle, and the hind limb; and a concluding chapter is given on "the correspondence between the bones of the anterior and posterior extremity, and the modifications of the positions of the limbs." The subject-matter of the last chapter has excited much interest among American anatomists, some of whom claim that there is an antero-posterior symmetry in animals, and that in the posterior members the homologue of the thumb is found, not in the great toe, but in the outer or smaller one. Professor Flower, however, contends that "it is necessary to place the limbs (at least in imagination) in an exactly corresponding position—one, in fact, which is often impossible in the adult animal, on account of the modifications of the articular surfaces to suit the posture best adapted for the habits and mode of life of the individual, but which is the position of all limbs when they first appear as budlike processes from the side of the body of the embryo."

This primordial condition is most approximated, among mammals, by the flying lemur (*Galeopithecus*) and sloths, and is very nearly the normal position of some reptiles, especially the tortoises. The chief modifications consist in the rotation backward, from its primitive position, of the humerus, and the rotation forward of the femur. Finally, "there can be no question but that the carpus and tarsus, the metacarpus and metatarsus, and the various digits, beginning at the pollex (thumb) in the one, and the hallux (great toe) in the other, are really homologous: the circumstance of the constant absence of one of the bones of the preaxial digit in both fore and hind limbs is most significant."

SKULLS OF HINDOOS.

At the meeting of the Boston Society of Natural History for March 1, a communication was presented by Mr. George Sceva, in which attention was called to the fact of the shortness of the upper jaws in the skulls of the Hindoos, and the frequent absence of the third molar. This generalization was based upon the examination of a number of crania; and it was found that about fifteen per cent. of the whole exhibit this peculiarity, while in an extensive series of skulls of European races only about one per cent. showed the same feature.

RELATION OF MAN TO THE GIBBONS.

Mr. St. George Mivart, an eminent English comparative anatomist, and one of the few first-class naturalists of the present day who positively oppose in their writings the views of Mr. Darwin as to the *modus operandi* of evolution, has lately called attention, in *Nature*, to the omission, on the part of that gentleman, to cite the species of monkey actually most nearly related to man, in his opinion. According to his view, it is in the gibbons, or long-armed apes, of the genus *Hylobates*, that the closest affinities to the human structure are to be met with; and although there are, perhaps, more points of apparent relationship between man and the chimpanzee, gorilla, or orang, than between man and the gibbon, yet there are certain points in which the latter genus resembles *Homo* in a more striking and significant degree. Although the enormous length of the arms of the gibbon apparently dis-

countenances the idea of relationship, yet Professor Huxley has shown that these are singularly human. Among the marked resemblances, the length of the leg as compared with the trunk, and the form and proportion of the bony thorax, are especially noteworthy.

Furthermore, one species of gibbon (the siamang) is the only ape that possesses a true chin, together with a slight prominence of the nose. The power, quality, and compass of voice in the gibbons are dwelt upon by Mr. Darwin as remarkably related to man, and also the gentle, yet quick and active nature. While making these suggestions, however, Mr. Mivart takes especial occasion to renew the expression of his antagonism to Mr. Darwin's theory of natural selection, taking into consideration the totality of man's being, and remarks that, so considered, science convinces him that a monkey and a mushroom differ less from each other than do a monkey and a man.—12 *A*, *April* 20, 481.

GAY-HEAD INDIANS.

A report has recently been made to the Legislature of Massachusetts by Mr. Richard L. Pease, of Edgartown, upon the numbers and present condition of the Indians now occupying the southwestern point of Martha's Vineyard, known as the district of Gay Head, prepared with special reference to the change in the policy of the state concerning these Indians, as well as several other remnants of the descendants of the aboriginal inhabitants. This change consisted in the abolition of the original condition of wardship, or their conversion into citizens having equal privileges with other members of the commonwealth. This was determined upon not merely on account of the former political anomaly, but because these people are not really Indians in any sense of the word, since, by repeated intermarriages with whites, negroes, Sandwich Islanders, etc., they have been transformed into a mixed race, totally different from the aboriginal inhabitants.

The whole number of the so-called Indians at Gay Head, according to the report, is 237, most of the men being seamen, farmers, and laborers, and a few engaged in mechanical pursuits.

They are an industrious, hard-working community, living in comfortable houses, and as anxious to make money as their

neighbors of purer blood. In the original political condition of these people the lands were all held in common, but measures are now being taken to divide them, under the provisions of the act by which Gay Head is made a township.—*Report of R. L. Pease to the Massachusetts Legislature.*

GIGANTIC FOSSIL RODENTS AND REPTILES.

No recent palæontological announcement has been of more interest than the discovery in the small island of Anguilla, in the West Indies, of fossil remains of extinct species of vertebrate animals, among them rodents of enormous size. These are closely allied to the chinchilla, which furnishes the well-known South American fur; but instead of being of about the size of a small rabbit, the largest fully equaled a cow in its dimensions, constituting the largest rodent on record, and considerably exceeding in bulk the castoroides, or fossil beaver of the United States. Of the remains thus far identified by Professor Cope there are five rodents, one deer, and two birds. In the same communication Professor Cope announces the discovery, in the collections of the Smithsonian Institution, of a new fossil lizard from New Mexico, which must have been about one hundred feet in length, being probably the longest known reptile.—*Proc. Am. Phil. Soc., December*, 1870.

FOSSIL WALRUS IN NEW JERSEY.

At a meeting of the New York Lyceum of Natural History, held during last autumn, Professor Newberry, the president, exhibited the anterior portion of the cranium of a walrus which had been found during the summer at Long Branch, by a gentleman whose foot struck against it while bathing. It was strongly silicified, but exhibited no appreciable difference from modern specimens. The precise age of this fossil could not, of course, be ascertained, although it is well known that its range was formerly much south of its present habitat. It is not unfrequently brought down on floating ice off the coast of Newfoundland; and although Labrador is at present the southern limit of its residence, it was once very abundant in the Gulf of St. Lawrence, and its remains have been found in the shell-heaps of the Bay of Fundy. It is probable that the specimen exhibited by Professor Newberry is a relic of the glacial period, although it was suggested that it might

have been of the tertiary age, which probably can not be verified. Other specimens of similar character are recorded as having been found on Martha's Vineyard; in Monmouth County, New Jersey; and in Accomac County, Virginia.—*Proc. New York Lyceum, October*, 1870, 75.

FOSSIL FISHES OF WYOMING.

In the course of a critical examination by Professor Cope of certain fossil fishes found on the Green River, in Wyoming, he discovered specimens of a species of *Osteoglossum* of large size, and previously undescribed. A specially interesting feature connected with this discovery lies in the fact that the genus is at present represented by living species in New Zealand, Borneo, and Brazil; but it has not hitherto been found in North America, nor is it any where known as a fossil.—*Proc. Am. Phil. Soc.*

CEPHALASPIS IN AMERICA.

Professor Dawson, of Montreal, has lately discovered in the Siluro-Devonian beds on the north side of Gaspé Bay the first known American species of the genus *Cephalaspis*, a kind of fossil fish especially familiar to all readers of Hugh Miller's works, as one of the forms which he was particularly successful in procuring. It has been recently described by Mr. E. R. Lankester, and called *Cephalaspis dawsoni*, after its discoverer.

MASTODON REMAINS.

The last number of the American Journal of Science records the discovery of a large part of the skeleton of a mastodon near Illipolis, Illinois. One of the tusks proved to be nearly ten feet in length, and twenty-nine inches in circumference three feet from the lower end. All the bones were in a fair state of preservation, and of a dark, spongy, and porous appearance. It is probable that the specimens will be added to the collections of fossils now being gathered together by Professor Worthen for the state cabinet.

NEW SPECIES OF LOPHIODON.

At the meeting of the Philadelphia Academy of Natural Science, January 3, inst., Professor O. C. Marsh, of Yale Col-

lege, exhibited a tooth of a new species of *Lophiodon* (a tapir-like animal), from the miocene marl of Cumberland County, New Jersey, which is the first indication of the remains of the tapir family on the Atlantic coast, or of the genus *Lophiodon* in this country east of the Rocky Mountain region. This species, which was named *Lophiodon validus*, was probably a contemporary of the *Rhinoceros matutinus*, described by Professor Marsh, from remains found at the same geological horizon in Monmouth County New Jersey.

PORT KENNEDY BONE CAVE.

The discovery of an ancient bone cave near Phœnixville, Pennsylvania, about twenty-five miles northwest of Philadelphia, has excited the greatest interest among naturalists. Professor Cope has been actively engaged in the investigation of the collection, and already reports the existence of about thirty species of vertebrates, together with numerous plants and insects. All of these, so far as known, are probably of extinct species, although their precise relationships have not yet been fully worked out. Among the reptiles were tortoises and serpents, and of birds there was a turkey and a snipe. The mammals, as Professor Cope anticipated, were most numerous, these including two carnivorous animals of large size, one of them a cat, and the other a bear, previously described by Dr. Leidy, of a remarkable type, and totally distinct from the cave bear, or any living species of either Europe or America. At least three species of sloths were discovered, mostly of gigantic size, one of them a species of *Megalonyx*, and two of the *Mylodon*. Besides these there were some ruminating animals, tapirs, and a small horse. With the other remains were the teeth and tusks of the mastodon. The fissure in which the bones were found was forty feet deep and fifteen feet wide; the length as yet has not been determined. Above the deposit of bones the cave was filled with washings of the triassic age from the neighboring hills.

PORT KENNEDY BONE CAVE AGAIN.

In the recently published proceedings of the American Philosophical Society we find a more detailed account than has yet appeared of the contents of the remarkable post-pliocene bone cave of Port Kennedy, near Philadelphia, of which we

have already made repeated mention. This, as may be remembered, was first explored by Mr. Charles M. Wheatley, of Phœnixville, and part of the material collected placed in the hands of Professor Cope for elaboration. In the present paper we have fuller indications of the results than heretofore, and we learn that thirty-four species of mammals, in all, have been obtained, nearly all of them extinct species, and a large proportion of them new to science. Of birds there are two species, a turkey and a snipe; also two species of tortoises, three or four of serpents, and a few batrachians. Of insects there are thirteen species of coleoptera, and two or three of other orders. In summing up the results obtained from these investigations, Professor Cope calls attention to the inference already drawn by himself and Professor Leidy as to the great difference in character between the post-pliocene fauna of North America and that of previous portions of the tertiary period; and the fact that, while the miocene mammalia are more or less similar to those of miocene Europe and Asia, and the pliocene vertebrata have a corresponding resemblance to those of the same period of Europe and Asia and the present one of Africa, the post-pliocene resemble, in many particulars, those of South America.

As, therefore, the difference in these faunas is too great to have been produced in so comparatively short an interval of time by evolution, if this be admitted as an element, we must look to marked changes in the relative distribution of land and water for the cause. It is therefore supposed that during the pliocene period, when the geographical affinities of America were westward, especially with Asia, a continent existed in the region now occupied by the Northern Pacific, which formed a connection between the two lands, over which the migratory movements could take place.

The difference from the South American fauna, at the same time, indicates also a separation by water, and the probable absence of any connection between Costa Rica on the one side and the higher lands of Colombia on the other. The occurrence then of the glacial epoch brought about the destruction of the pliocene fauna, while, at the same period, the connection with Asia was severed by the submergence of this Northern Pacific continent. At the time of the northward retreat of the ice-sheet, mammalian life was probably extinct

in North America, and a renewal could not be obtained from either Asia or Europe, as these were cut off by water, but the concomitant elevation of Panama and other portions of Middle America furnished a bridge over which travel could be accomplished. In this view is explained the preponderance of South American types in the post-pliocene period, since, of the remains from the Port Kennedy cave, out of thirty-four we have eleven belonging to purely South American forms, eleven genera common to both hemispheres, and nine of doubtful position.

Again, a further modification of the fauna has been effected by the change of level which took place between the time of the introduction of the post-pliocence fauna and the present period, this consisting in an extensive submergence of land, especially in arctic latitudes. This, according to Professor Dana, as quoted by Professor Cope, near Montreal was 450 feet or more, and in the arctic regions 1000 feet. This descent of level Professor Dana considers to have been the cause of the melting of the glacial ice, the stratification of the drift, the deposition of gravels, and elevation of temperature, all these changes naturally preceding the introduction of post-glacial fauna from a warmer region. The Champlain epoch is regarded as opening the post-pliocene, and its fauna to be represented by the walrus, which extended its range to Virginia, the reindeer, reaching to New Jersey, and by the white whale.—*Proc. Amer. Phil. Society*, 1871, 75.

FOSSIL MAMMALS OF CALIFORNIA.

In a recent communication to the Academy of Natural Sciences, by Professor Leidy, attention was invited to certain teeth of fossil mammals forwarded to him for examination by Professor Whitney. One of these was a fragment belonging to the *Mastodon americanus*, obtained from a depth of eighty feet beneath the basaltic lava of Table Mountain, Tuolumne County, California, where it was found associated with the remains of human art. There was also a molar of a large fossil horse found sixteen feet below the surface on Gordon Gulch. Two other teeth, somewhat similar in character, were determined as belonging to the species of *Protohippus*. In other specimens Dr. Leidy found evidences of the existence of a gigantic animal of the camel tribe, allied to the llama.—2 *D*, 1871, 50.

REMAINS OF THE WOLVERINE.

An interesting discovery has lately been made in England of the detection in a bone cave of the remains of the wolverine, or glutton. This, according to a correspondent in *Nature*, is of the greatest interest, as occurring in a region where bones of the reindeer, moose, etc., had previously been found, and upon which this animal in pre-historic, as now in more modern, times was accustomed to feed.—12 *A*, *March* 30, 1871, 425.

NEW FOSSIL MAMMALS.

Professor Leidy has lately announced to the Philadelphia Academy of Natural Sciences the existence of some new fossil mammals from the tertiary formations of Wyoming Territory. One was a lower jaw, discovered by Dr. J. Van A. Carter, in the vicinity of Fort Bridger. The animal to which it belonged was as large as a hog, but was more nearly allied to the rhinoceros or tapirs. It was especially remarkable for the possession of a large pair of front teeth, resembling, both in form and construction, the incisors of the beaver. The name proposed for it was *Trogurus castoroideus*, or the beaver-toothed gnawing-hog. Another of the fossils indicates a carnivorous animal, a contemporary of the former, and about the size of the gray fox. The animal was related to the weasel and canine families, and was called *Sinopa rapax*, the former name being that applied by the Blackfeet Indians to a small fox.

Professor Leidy also exhibited photographs of the lower part of the jaw of the American mastodon, recently received from Professor W. C. Kerr, state geologist of North Carolina. The jaw was found in Lenoir County of that state. It belonged to a mature male, and was of special interest from its retaining both tusks, as well as the molar teeth.—2 *D*, *May* 16, 1871.

ON THE EXTINCT BATRACHIAN FAUNA OF OHIO.

At a late meeting of the American Philosophical Society Professor Cope made a communication upon the extinct batrachian fauna of the carboniferous formation of Linton, Ohio, based upon material obtained by Professor J. S. Newberry, di-

rector of the Geological Survey of Ohio, and professor in the School Mines of Columbia College. Up to the present time twenty-seven species have been discovered, most of them previously described by Professor Cope, although some of them are new species, announced now for the first time.

It would appear from Professor Cope's statement that no true reptiles have yet been obtained in the coal measures, all of them belonging unmistakably to the Batrachia, although species were met with closely resembling serpents, lizards, and crocodiles.—*Proc. Am. Phil. Soc.*

DISAPPEARANCE OF WISCONSIN ANIMALS.

Dr. Hoy, in a paper before the Wisconsin Academy of Sciences, Arts, and Letters, remarks, in reference to the mammals of Wisconsin, that the elk existed in that state as late as 1863, but is now probably extinct. The moose is still found in considerable numbers. The last buffalo was killed in 1832. Antelope were also found in Wisconsin in the time of Father Hennepin, although now, of course, driven far to the west. Most of the wild animals are diminishing very rapidly in number, the panther and deer being almost exterminated. The otter and beaver, however, are very persistent. The last wild turkey was killed in 1846 near Racine.—*Bull. Wisc. Nat. Hist. Soc.*, 1871, 62.

DARWIN'S "ORIGIN OF SPECIES."

It is understood that Mr. Darwin is now preparing a new edition of his "Origin of Species," in which he will answer the objections of weight which have been urged against the theory of natural selection.

FOSSIL IVORY IN ALASKA.

The San Francisco papers are calling attention to specimens of fossil ivory brought from Alaska, and parties are said to be about entering upon the business of collecting it on a large scale. This ivory consists of the tusks of the mammoth or fossil elephant (*Elephas primigenius*), the remains of which are extremely abundant in Alaska, but much more so in Siberia, from which latter country, as is well known, an appreciable percentage of all the ivory now used in the arts is obtained.

SUMATRAN ELEPHANT.

The existence of two species of elephants has long been established—the African and the Indian, the former differing from the latter in having much larger ears, which cover the greater part of the shoulders, as well as the whole neck, and often touch each other upon the nape. This difference is so striking as to be appreciable at once, although there are still other characteristics, such as the more arched and less flattened forehead of the African, the more stoutly developed tusks which are often found in the female, while, as is well known, the female Indian elephant is entirely destitute of these weapons. More recently, the fact that the island of Sumatra is the only one in the Indian Archipelago where the elephant occurs in a wild state suggested the inquiry whether this might not be a distinct species, and the investigations of Dr. Schlegel, the eminent director of the Leyden Museum, have led him to this conclusion. Like the elephant of the main land of India, the ears of this animal are very small, and the form of the skull is somewhat the same; but the number of dorsal vertebræ, as well as of pairs of ribs, differs decidedly, there being twenty-one in the African elephant, twenty in the Sumatran, and nineteen in the Indian. The Sumatran elephant seems to be more slender and delicate in its form, and to have a longer and thinner snout. It is also said to manifest decidedly greater intelligence than the elephant of Bengal.—*Zoologische Garten*, II., 1870, 333.

GAME-TRADE AT CHICAGO.

An interesting article appeared lately in the Chicago Times in regard to the game-trade of that city. This contained an elaborate account of the different kinds of game, both flesh and fowl, brought into Chicago, with the names of the dealers, and the statement of the receipts and sales. According to this article, there have been two new features of the market of that city in the past season. First, the shipment of a great many grouse and quail direct to England, where they arrive in about eighteen or twenty days, and where they brought good prices; second, the canning of prairie chickens, which has been done to the extent of three hundred dozen on one single Baltimore order. The cans are made large enough to

hold a single bird and the gravy, and the experiment was so successful that it is thought probable it will be continued on a large scale in the coming season. The names of about seventy firms are mentioned as the larger dealers in game, while those of the smaller ones are not enumerated. The following recapitulation of the principal varieties of game, and the aggregate number, weight, and average cost, and the sum total of the proceeds, will be scanned with interest by our readers:

Articles.	Number.	Average Cost.	Amount.
Buffalo, lbs.	160,000	$ 07	$ 11,200
Antelope, lbs.	94,300	10	9,430
Venison, lbs.	109,350	10	10,935
Bear, lbs.	7,700	08	616
Grouse, doz.	42,800	3 50	149,800
Quail, doz.	88,595	2 00	117,190
Ducks, doz.	63,840	3 00	191,520
Geese.	4,650	80	3,720
Brant.	1,990	40	793
Partridges, doz.	104	4 00	416
Snipe, doz.	1,120	2 00	2,240
Woodcock, doz.	100	2 00	200
Pigeons, doz.	33,333	1 25	41,666
Turkeys.	1,532	2 00	3,064
Rabbits, doz.	15,362	1 00	13,360
Squirrels, doz.	300	60	180
Total.	....	......	$556,330

—*Chicago Times.*

WHALES EAST OF EUROPEAN NORTH CAPE.

However rare whales are becoming in the seas north of America and Eastern Asia, they are said to be extremely abundant at the present time to the east of the North Cape of Europe, ten or more having been found stranded on the shores in a single season. All the beaches in that region are said to be strewn with bones or partially decomposed carcasses, which can be scented at a great distance. The species of whale is not well ascertained, but it is said to attain sometimes the length of 110 feet.—17 *C*, 1871, 36.

IMMUNITY OF THE PIG FROM INJURY BY SERPENT BITES.

The impression is generally prevalent in the United States that the common domestic pig is an especial enemy of all kinds of serpents, and that it is capable of receiving the bite of the rattlesnake and copperhead without the slightest per-

sonal inconvenience or injury. This same immunity from harm would seem to exist in other countries, as a late writer in the London Field remarks upon the fondness of the pigs in India for the cobra de capello, and states that he has repeatedly seen them in conflict, and has observed the pig to be bitten over and over again in the snout and about the face by the writhing reptile, and in no instance with the slightest ill result to the aggressor.—19 *A, November* 4, 1871, 391.

ORNITHOLOGICAL PUBLICATIONS IN 1870.

The October number of The Ibis, a quarterly journal of ornithology published in London, contains a summary of the progress of ornithological science for 1870, enumerating the names of writers upon this subject, with the titles of their publications. The total number of such authors mentioned in the list is 164, while the number of separate works and of papers (in scientific memoirs, transactions, proceedings, etc.) reaches 316. Strange to say, only 22 new genera have been adopted, although 288 have been proposed. Figures of 270 species, together with numerous plates illustrating the anatomy, the nests, and the eggs, have appeared. Due prominence and full credit are given to the comparatively small number of American writers whose names appear in the list.—*Ibis, October*, 1871.

TRANSPORTING LIVING ENGLISH SPARROWS.

A great demand for the English sparrow in various parts of the United States has induced their importation from England and Germany in large numbers, but in many instances, where this has been done in large cages, most of the birds have died on the passage. In one instance in our recollection, where four hundred were placed in two cages, only seven were safely landed in New York. Persons who have given this subject their attention advise that the importations be made in long low cages, known as store cages, which are two or three feet long, about nine inches high, and twelve from back to front, with perches within two inches of the bottom. In a cage of this kind three or four dozen can, it is said, be readily transported, provided they be supplied with proper food, as well as with sand, and fine gravel, and plenty of water.—2 *A, June* 3, 1871, 393.

BIRD-TRADE OF GERMANY WITH THE UNITED STATES.

In a recent article upon the bird-trade of Germany with the rest of the world, we are informed that the single firm of Messrs. Reiche, of Alfeld, are in the habit of shipping immense numbers of living birds to the United States, consisting mainly of canaries, but including also goldfinches, sparrows of every species, including the house-sparrow, larks, etc. Their shipments to this country during the year 1869 amounted to 26,000 canaries and 15,000 birds of other species—the total number of canaries exported by all the dealers to North America amounting probably to not less than 45,000 annually. The shipments generally begin in the month of August, with the first spring brood, and are continued uninterruptedly until April. These, in nearly all instances, have been carefully trained before shipment, and it is now possible for a few dollars to obtain birds that not many years ago would have cost more than ten times that amount.—1 *C*, 1870, xxx., 473.

PECULIARITIES OF THE FLORIDA WILD TURKEY.

A gentleman who has spent a good deal of time in Florida is decidedly of the opinion that the wild turkey of that state is quite different from that of the North, and that it maintains a much closer relationship to the New Mexican turkey (*Meleagris Mexicana*). According to his statement, the head of the wild turkey of Florida is red, like that of the domestic, its color in the Northern species of wild turkey being blue. The flesh also is white, as in the domestic turkey, and the tip of the tail fulvous instead of chestnut. The hunters from Mississippi who visit lower Florida notice this difference in the color of the heads of the Florida and Mississippi turkey, and consider them distinct. The gentleman in question is not familiar with the wild turkey of Northern Florida, and confines his remarks to those on the southern portion of the Gulf coast of that state.

CHANGE IN THE HABITS OF THE KEA PARROT OF NEW ZEALAND.

Mr. Potts, a well-known ornithologist of New Zealand, calls attention, in a late number of *Nature*, to a curious change that has taken place in the habits of the kea parrot, belonging to

the Australian genus *Nestor*. When the island was first discovered, this bird was known to make use of its brush-like tongue in gathering honey from the various flowers, and in feeding upon the berries of the plants belonging to its neighborhood, this diet being varied by the capture of an occasional insect. It now appears that the first change consisted in its resorting to the scaffolds used by the settlers for drying meat, and then to the sheep-skins suspended in the air. Now it has become the veritable pest of the country, from its habit of lighting upon the backs of sheep and picking away the wool, and then tearing out the flesh, thus causing a peculiar sore, which was originally supposed to be a new kind of disease, and not until quite recently was it ascertained that it was due to the attacks of the kea parrot.—12 *A*, *October* 19, 1871, 489.

EXISTING SPECIMENS OF THE GREAT AUK.

According to a late paper by Mr. Victor Fatio, published in the Bulletin of the Swiss Ornithological Society, the total number of the skins of the (probably now extinct) great auk in Europe and in the United States amounts to seventy-one, or possibly seventy-two. Of these, four are in the United States, namely, one in the Philadelphia Academy of Natural Sciences; one at Vassar College, Poughkeepsie; one at the Smithsonian Institution, Washington; and one in the possession of Mr. Robert L. Stuart, intended for the New York Museum of Natural History. Seven skeletons are enumerated as existing in Europe, and two (one?) in the Museum of Comparative Zoology of Cambridge, Massachusetts. Of eggs, the author enumerates sixty-three specimens in Europe, and two in the United States, of which one belongs to the Academy of Natural Sciences, and the other is in the Museum of the Smithsonian Institution, having been presented to it by the Philadelphia Academy. This enumeration of the remains of this bird is believed to be very nearly accurate; and although a few more specimens may yet be detected in local museums, it is not likely that the total can be much increased. The limited number extant will sufficicntly explain the high price which specimens of both skins and eggs bring when offered for sale, the sums obtained for the former varying from $500 to $1500, and for the latter from $250 to $350.

Detached bones of the skeleton of the great auk are not at all uncommon in American collections, the critical examination of the shell-heaps of the New England coast and of the Bay of Fundy having brought to light quite a considerable number. The specimens collected are mainly in the museum of the Peabody Institute, Salem; the Peabody Museum, Cambridge; and of the Smithsonian Institution at Washington.

RELATION OF WEIGHT TO LENGTH IN CROCODILES AND ALLIGATORS.

Professor Phillips, of the Museum at Oxford, is very desirous of learning the relationship between the length and weight of crocodiles and alligators of all sizes, and requests the friends of science to make as many experiments on this subject as possible, and to transmit the result to the University Museum at Oxford. Mr. Buckland recommends that, if the living animal be experimented upon, it be first placed in a bag. We commend the inquiry to such of our readers as may visit Florida this winter, in hopes that the many opportunities of answering the question there will be utilized. Information sent to the American Naturalist Magazine at Salem, Massachusetts, or to the American Journal of Science at New Haven, Connecticut, will no doubt be at once published, and thus made accessible to Professor Phillips.—2 *A*, *November* 12, 1870, 350.

COD-FISHERIES OF ALASKA.

As was foretold by sagacious prophets, the cod-fisheries in Alaska continue to increase in economical importance to the country, the catch during the present year having amounted to over 1,300,000, all the fish of large size. Should the cod-fisheries of the Banks of Newfoundland fail in the course of time, as is feared by some, it is quite probable that we shall be obliged to depend upon the Alaska seas for our supplies. As the shoals frequented by cod in these seas vastly exceed in area all those of Newfoundland, and the fish themselves are of equal size and excellence, and in much greater relative abundance, we can look forward with equanimity to the transfer of that branch of the fishing interest from one side of the continent to the other, satisfied, as we may well be, that a plentiful supply will always be available for consumption.

OCCURRENCE OF THE POMPANO NORTHWARD.

Attention is called in the New York Herald of September 2 to the occurrence in the vicinity of New York of the pompano, or crevallè (*Trachynotus carolinus*), a favorite delicacy among the fish of the South Atlantic and Gulf coast of the United States, and its presence is connected with a supposed increase of temperature in the waters of our shores, consequent upon the driving inward of the Gulf Stream by the prevailing southerly winds of this season. The range of this fish for the present summer extends far to the east of New York, quite considerable numbers having been taken in Vineyard Sound and Buzzard's Bay. Although previously unknown of so large a size, it was not entirely a stranger to these waters, since it may be found in every season of moderate dimensions; and as long ago as 1855, Professor Baird, of the Smithsonian Institution, in a report upon the fishes of New Jersey, states that he had seen them taken by thousands in the sandy coves of the outer beach near Beesley's Point. These, however, were all rather small, scarcely exceeding a quarter to half a pound in weight.

The Spanish mackerel, another fish to which the Herald article refers, has also been known much longer than is generally supposed. Dr. Mitchill, in his work on the "Fishes of New York," published in 1817, gives it as of occasional occurrence; and it may be, after all, a question whether the greater frequency with which it is now seen does not depend on the improved methods of capture rather than upon any great degree of difference in abundance. During the present season it is less abundant on the New England coast, from Newport to Vineyard Sound and Buzzard's Bay, than last year, although, to judge from the market price, it is taken much more largely nearer New York. We are informed that the price has ranged as low as ten cents a pound, while at Newport it has retailed at a dollar and even more. It is worth in the New Bedford market at the present time about thirty-five cents.

INCREASE OF SALMON IN THE BRITISH PROVINCES.

It will interest our American sportsmen, who are in the habit of visiting the British provinces for the purpose of

catching salmon, to learn that the last report of the Commissioner of Fish and Fisheries for New Brunswick and Nova Scotia announces a very decided increase in the number of salmon, in consequence of the protective measures that have been established by the Dominion government. He recommends, what will also be agreeable news to our fishermen, that the salmon rivers be freely leased to gentlemen, under proper regulations, as the best method of preventing illegal poaching, and the improper destruction of breeding and immature fish. Among the chief measures to which the increase in question is due is ascribed the introduction of ladders into the dams on the streams, both salmon and alewives, by their means, passing up waters from which they had for a long time been absent.—*Report of Canada Department of Marine and Fisheries*, 1869, 1870.

USE OF THE PECTORAL FINS OF FISH.

Mr. Hansen, in discussing the movements of the fins of fishes in water, remarks that the propelling power of the pectoral fin is directed upward and forward, and is intended to assist the passage of the water into and out of the gills, and thus aid in respiration. When only one pectoral fin is moved, the body rotates around its longitudinal axis; a more decided movement of both fins will raise the anterior extremity of the body in the water. When flying-fish ascend quickly to the surface by means of the active movement of the pectoral fins, they describe an arc over the water, but ultimately fall back into it. For this reason they are scarcely to be included among flying animals.—1 *C*, 1870, XLV., 720.

RELATIONS OF GANOIDS TO PLAGIOSTOMES.

Dr. Albert Günther, of the British Museum, has presented an elaborate communication in *Nature* upon the relationships of the remarkable animal discovered not long since in Queensland, known as the *Ceratodus forsteri* (or Dawson salmon), which is, in general characters, an amphibian-like fish, allied to *Lepidosiren*, etc. Considering *Ceratodus* as a form of ganoid fishes, Dr. Günther has been induced, as the result of his investigations, to unite the *Plagiostomata* (sharks and rays) with the ganoids, since they agree in having a third contractile chamber in addition to the ordinary two divisions of

the fish heart. This *bulbus arteriosus* is very different from the *bulbus aortæ* of other fishes, where it is simply a swelling of the walls of the aorta, not contractile, without valves in the interior, and separated from the heart by two valves opposite to each other. This character is also supported by two others of great importance, viz., the presence of a spiral valve in the intestine, which is found in a more or less developed state in all the ganoids, but entirely absent in other fishes; and by the optic nerves being placed side by side, and not decussating as in ordinary fishes. The occurrence of the chimæras as an intermediate rank between the plagiostomes and ganoids is considered as strengthening the view thus taken, and accordingly Dr. Günther proposes the name *Palæichthyes* for this sub-class; the remaining orders of fishes being distinguished, as already indicated, by possessing a two-chambered heart with a rigid bulbus aortæ, and decussating optic nerves, and in never exhibiting a trace of spiral valve in the intestine.

Of the new sub-class indicated by Dr. Günther there are now known 140 species of sharks, belonging to 34 genera, and 150 species of rays, of 25 genera, and inhabiting all the seas of the globe, but decreasing in numbers from the tropics toward the poles, very few of them entering, or at least living in fresh water. These constitute the order *Plagiostomata.* In the order *Holocephala* there are but four species, viz., three *Chimæras* and one *Callocephalus*, these being restricted to the seas of the temperate zones of both hemispheres, and absent between the tropics.

The order of *Ganoidei* is composed of fresh-water species; one of *Amia* from North America; three of *Lepidosteus;* two of *Polypterus* from Africa; two of *Polyodon*, or shovel-nosed sturgeon, one of them found in the Mississippi and the other in China; about twenty-five sturgeons from the northern hemisphere; two species of *Ceratodus* from tropical Australia; one of *Lepidosiren* from the Amazon River; and one of *Protopterus* from tropical Africa.

As the total number of fishes known at present is about 9000, the sub-class of *Palæichthyes* forms only 3.6 per cent. of the number. Dr. Günther is, however, of the opinion, from the extent of the regions hitherto unexplored in respect to their fishes, that perhaps we are scarcely acquainted with

more than one tenth of the kinds of fishes actually existing. —12 *A*, *September* 28, 1871, 434.

THEORY OF THE SALMON-FLY.

In reply to the question, Why does the salmon follow the artificial fly, and what does it take it to be? Dr. Günther, the well-known ichthyologist, says that if we catch a prawn (one of the principal articles of food of salmon) in the sea, swimming in jerks, we at once observe that by means of the rod we impart to the fly the peculiar motion of the prawn, while the iridescence of the real creature is reproduced by the colors of the fly, which must vary according to the physical changes of the sky and water. No two things can be more unlike than a prawn and a dry, artificial fly; yet, according to Mr. Günther, no two things are more alike than a swimming prawn and that same fly in the water, worked by a skillful hand.

CAPTURE OF HORSE MACKEREL IN BUZZARD'S BAY.

A somewhat interesting capture was made during the past summer in one of the fish-pounds in Buzzard's Bay, near Wood's Hole, Massachusetts, the strange visitor being a specimen of the tunny, *Orcynus secundidorsalis*, sometimes called horse mackerel and albicore in this country. The specimen measured nine feet in length, and weighed five hundred pounds, although frequently found weighing five hundred, or even a thousand pounds more than this.

The horse mackerel is not an unusual visitor to the eastern coast of the New England States, and is found as far north at least as the Bay of Fundy, where, and especially about Provincetown, it is sometimes harpooned in considerable numbers. It very rarely comes within the bays on our coast, the individual in question being the only one that has been captured within the memory of the fishermen in Buzzard's Bay. The specimen has been skinned, and will, it is understood, be exhibited in due time as one of the treasures of the National Museum at Washington.

The flesh of the horse mackerel is of excellent quality, being more like butcher's meat than like fish, and closely resembling tender pork in color and texture. It is, however, much less valued as food in the United States than in Eu-

rope, where this species, or a close ally, has long been a favorite in the market.

DID HENDRIK HUDSON FIND SALMON IN THE HUDSON RIVER?

The authority of Hendrik Hudson's journal is cited to prove the former existence of salmon in the Hudson River, and as an argument in favor of the feasibility of stocking its waters with this fish. Mr. J. Carson Brevoort, of Brooklyn, a gentleman of great research in such matters, maintains, however, the fish referred to by Hudson is really the weak-fish, or squeteague (*Otolithus regalis*), as it was taken in large numbers by this early voyager in the middle of September, in seines, somewhere in the lower part of the bay, and at a time when and place where no true salmon could be thus captured. An inexperienced observer might very easily call a weak-fish a salmon, the general resemblance being so close that the name of salmon-trout is, even now, generally applied to the Southern variety of the weak-fish. The pike-perch, or wall-eyed perch (*Lucioperca americana*), is also called salmon in the Susquehanna River, with much less resemblance to the genuine article than the weak-fish.

BLACK BASS IN THE POTOMAC.

It is well known to naturalists that the black bass, now so common in the Potomac River, and furnishing so much sport to the angler, as well as constituting so valuable an article of food, is not indigenous, but has been transferred from other waters. The species of this genus (*Grystes*) belong to the waters of the Mississippi Valley and of the great lakes, but on the Atlantic coast were originally restricted to the region south of the James River—the Potomac, Susquehanna, Delaware, Hudson, and other great streams of the Middle and Northern States being without them. They have been transferred to many localities, both streams and ponds, and it is likely that before a great while they will be well known throughout this country, as it is even proposed to carry them to California. Controversy has lately arisen as to the person to whom is due the credit of the first introduction of this fish into the Potomac, the honor being assigned by some to Dr. Eoff, of Wheeling, and by others to Mr. William Schriver. The question, however, can be readily determined by refer-

ence to the report of the Smithsonian Institution for 1854, where may be found a communication from Mr. Eoff himself on this subject, giving an account of the habits of the black bass, and stating that Mr. William Schriver, of Wheeling, thinking the Potomac River admirably adapted to the cultivation of the bass, had, the preceding season, carried some twenty or more alive in a box, in the water-tank of a locomotive from Wheeling to Cumberland, his former residence, and placed them in a canal basin at that place, where he hoped they would do well, and be a nucleus from which the stock might soon spread. This, of course, effectually settles the controversy in favor of Mr. Schriver.

CAUSE OF DEATH OF FRESH-WATER FISH IN SALT WATER.

In a communication by M. Bert to the Academy of Sciences of Paris upon the death of fishes living in fresh water when immersed in sea water, he stated that these fishes are literally suffocated by a singular effect of desiccation, the exosmose being very active, especially when their skin is clothed with large scales. The phenomenon as observed in frogs is quite extraordinary, these losing the greater part of their weight, and becoming almost as much dried up as if they had been salted alive. In regard to the action of fresh water upon salt-water fish, he found that they are too heavy for this medium, and generally remain at the bottom of the water, while the fresh-water fish always swim at the top of salt water.—12 *A*, *August* 24, 1871, 339.

PROPER FISH FOR STOCKING RIVERS.

Of the many fresh-water fish characteristic of the continent of North America, comparatively few, with the exception of members of the salmon and trout family, are of sufficient economical value to make it expedient to introduce them into regions where they do not naturally occur. This transfer has been made to a very disastrous extent in the case of the pike (*Esox*), which, although multiplying rapidly, is at the same time the determined foe of all other kinds of fish, and soon almost exterminates them from the waters which it inhabits. For this reason some states have passed laws prohibiting, under severe penalties, except by direct permission of the Commissioners of the Fisheries, any transfer of the species in ques-

tion to new localities. There is, however, one fish that is of great value, and which can be introduced without as much doubt of the propriety of the act as exists in regard to the pike. We refer to the black bass (*Grystes* of authors). This inhabits, in one variety or another, the basin of the great lakes, of the Mississippi Valley, and the upper waters of the streams of the South Atlantic coast as far north as the James River. Within a few years it has been transferred with success to streams previously uninhabited by it—to the Potomac, for one, where it is now extremely abundant. During the past summer some public-spirited gentlemen of Philadelphia collected among themselves a fund to stock the Delaware with this noble fish, and obtained about seven hundred, principally in the vicinity of Harper's Ferry. These were carried alive in large tanks to the Delaware, and deposited in that stream at Easton, about two hundred of the number dying by the way. The same party of gentlemen propose to use a surplus fund in their hands in experimenting upon the re-stocking of the river with shad and salmon.

LIVING EYELESS FISH.

Visitors to the Dublin Zoological Gardens have been much interested in some living specimens of the eyeless fish found in the Mammoth Cave, recently carried there, and now in perfect health. The small specimens are so transparent that the vertebral column, the heart, and optic bulbs may be distinctly seen. In the largest there are dark red spots over the optic bulbs, which, it is suggested, are due to their having been kept in an iron tank, which may have given color to a rudimentary pigment of the membrane.—12 *A*, *Oct.* 6, 1870, 454.

STOCKING WATERS OF NEW YORK WITH FISH.

The Commissioners of Fisheries for the State of New York have lately announced, in the public papers, their readiness to furnish, free of expense, living black bass, catfish, white bass, rock bass, roach, perch, sunfish, and pike-perch, for stocking the waters in any part of the State of New York, provided parties desiring them will send an agent to receive and take charge of them. All of these are now bred at the state establishment at Caledonia, and applications for them are to be made to Seth Green, Rochester.

KILLING FISH WITH TORPEDOES IN FLORIDA.

The use of torpedoes for killing fish for manure has lately been introduced on the coast of Florida. The business is carried on about six miles below New Smyrna, at Mosquito Lagoon, and the method adopted is said to consist in exploding the torpedoes in the water, under the schools, as they pass by. In addition to the many that are killed outright, and float on the surface, large numbers are wounded, and go off elsewhere to die, without being caught. This practice, we are assured, has already resulted in a very marked diminution of the schools of fish in that vicinity, and has been greatly resented by the people of the state, who are endeavoring to drive the operator from its waters.—*Letter.*

FUNGUS GROWTHS ON FISH AND THEIR EGGS.

In a recent article, Professor Willkomm, of Tharaudt, in Germany, discusses the subject of the cryptogamic growth which so frequently interferes with the business of artificial fish-breeding, by attaching itself to the eggs or to the young fish, and destroying them; and after considering in detail the various suggestions made by writers in regard to this parasite, endeavors to show that it is simply the alternate condition of the ordinary mould (*Mucor mucedo*) which develops itself, under favorable circumstances, in the air. This was proved by transplanting filaments of mould to fish or eggs, and finding them develop into the species in question; and *vice versa*, by taking the filaments from the fish, and planting them in the air, they produce genuine mould. The generic name adopted by our author for the plant in question is *Saprolegnia*, as established by Nees von Esenbech, who called it *S. molluscorum.*

Dr. Willkomm is even of opinion that the fungus which forms on dead flies and other insects in such large quantities, and known as *Achlya prolifera*, as well as the *Empusa muscæ*, which develops on living insects in the air, is merely a different form of the same polymorphous growth, and which, when taking root on perfectly sound, healthy animals, may impart disease to them, and even produce death. It is also suggested that the *Tarichium* of Dr. Cohn, which produces a new caterpillar disease, is a still different phase of the same

growth. He refers the origin of the fungus growth upon fish and their eggs to the sporules which are continually floating in the air, and which only require a favorable nesting-place for their development; and he makes an important practical suggestion in the interest of fish culture, especially that of trout and salmon. He advises very earnestly that the water used for hatching eggs and raising young fish be derived, as far as possible, from springs, and at or near their source, and even urges the transportation of such water for a long distance in closed pipes, for the purpose of securing that which will be measurably free from the danger mentioned. In this way he thinks there is much less danger of having the fungus spores fall into the water, and producing disease. He himself found, after adopting this plan at the fish-breeding establishment in Tharandt, that for the first time the operations were not interfered with by the death of a large percentage of eggs and new-hatched fish from this disease, while for the twelve previous years a large number were annually lost. A loss of not over fifteen per cent. of the eggs is considered quite favorable, since sometimes fifty per cent. or more die, in spite of the utmost precaution.

DIFFERENCE OF BACTERIA FROM FUNGI.

Some researches by Dr. Sanderson upon the intimate pathology of contagion have led him to very careful investigations into the conditions under which microzymes (bacteria) and fungi become developed in various solutions. The results at which he arrives are of great importance. Microzymes are not capable of being transmitted from one solution to another by means of air. On the other hand, fungi, as is well known, are capable of being so transmitted. If proper precautions in its preparation be taken, a solution (Pasteur's, e. g.) may be exposed to the air for months in an open vessel without the development in it of a single bacterium, while fungi (i. e., *Mycelium torula*) will be developed in it in proportion to its amount of exposure to the air. In order to insure this result, all that is necessary is to boil the solution, and thoroughly rinse with boiling water the vessel that is to contain it.

The addition of a drop of ordinary distilled water is sufficient to cause rapid development of bacteria in abundance in

such a solution. If the distilled water be previously boiled, no such development ensues. These results show clearly that there is no developmental connection between microzymes and *torula* cells, and that their apparent association is one of mere juxtaposition.

There is also in this paper an account of a series of experiments with sealed tubes containing organic and other solutions, which were, as in Dr. Bastian's well-known experiments, submitted to a high temperature, special experiments being also made with tubes in which more or less perfect vacuum was produced; Dr. Bastian, as it will be remembered, believing he had found that low organisms developed themselves more rapidly in fluids existing in an atmosphere of low tension. Dr. Sanderson's conclusions are entirely at variance with those of Dr. Bastian. In no case where proper precautions were taken to exclude and destroy germs did any development of life whatever take place.—13 *A*, *November* 1, 1870, 500.

MICROSCOPIC FORMS IN THE ATMOSPHERE.

According to a late communication by Ehrenberg to the Academy of Sciences of Berlin, he has succeeded in determining the existence of five hundred and forty-eight species of organic forms, absolutely invisible to the naked eye, and held in suspension in the atmosphere.—15 *A*, *October* 21, 1871, 531.

LIVING INSECTS IN SALT WATER.

Dr. Packard has lately announced the discovery, by Professor Verrill, of a dipterous larva of the genus *Chironomus*, at a depth of one hundred and twenty feet, in the vicinity of Eastport, Maine. He also describes a mite, or *Acarus*, as occurring at a similar depth. He has not yet ascertained whether, like other species of the genus, the latter lives, in any of its stages, in the gills of the lamellibranchiate mollusca.

WHITE ANTS IN ST. HELENA.

A recent communication to the State Department from the United States Consul at St. Helena states the fact that the white ants, which have effected a lodgment in the island, are rapidly destroying every thing upon it. No wood but teak, and sometimes not even that, escapes their fangs, and num-

bers of houses in Jamestown have been fairly gutted by them —doors, window-sashes, floors, and roofs all being eaten up, leaving nothing but the bare walls.—*Letter.*

SPREAD OF THE CABBAGE BUTTERFLY.

According to Dr. Uhler, of Baltimore, the European cabbage butterfly (*Pontia brassicæ*), the pest of the agriculturist, has reached Baltimore in its invasion of the United States. It has been known for some years more to the eastward, and has been slowly but surely creeping along, until it bids fair to involve the whole country in its ravages.—*Letter from Dr. Uhler.*

OYSTER BEDS OF GERMANY.

Professors Möbius and Hensen have been lately engaged in a careful investigation of the condition of the oyster beds of Schleswig, and have ascertained that a full-grown oyster can produce a million of young in a single season. They also ascertained that the Schleswig oysters at least have no decided manifestation of sex during the winter, but that, prior to the breeding season, in some the cells of the generative glands develop spermatozoa, while others develop only eggs, the numbers in the two divisions being about equal. This sexual development is later in the deeper beds than in the more superficial ones, probably because the stimulus of increasing heat acts earlier at shallow depths than at greater ones. They also found reason to believe that the egg-bearing generative glands, after discharging their eggs, appear to have spermatozoa to form in them.—19 *C, October* 21, 1871, XLII., 344.

ENEMIES OF OYSTER SPAT.

According to Mr. Buckland, among other enemies of young oysters in the English breeding parks or ponds are certain small fish, such as the gobies, sticklebacks, etc., which devour the spat with intense relish. He finds in these minute enemies the reason why such poor success has attended many of the experiments in oyster breeding, and advises that some fish be introduced especially addicted to destroying the young fish fry in question. A comparatively small number of young bluefish would probably very soon exterminate

these depredators, destroying them at the rate of several hundreds each per day.—2 *A*, *September* 9, 1871, 162.

ALLEN ON THE BIRDS OF EAST FLORIDA, ETC.

One of the most original and important contributions to the zoology of the day is that constituting the third number of the Bulletin of the Museum of Comparative Zoology at Cambridge, treating upon the mammals and winter birds of East Florida. The author, Mr. J. A. Allen, an assistant of Professor Agassiz, is well known for the thoroughness of his research into the vertebrata of America, and the critical attention paid by him to the proper limitation of species, both in their relationships to each other, and in their geographical distribution. In the present work he gives a summary of the views to which he has been led within a few years past by his studies of the immense collection in the Cambridge Museum, and makes numerous important generalizations. Among these he corroborates the conclusion previously announced by others of the diminution in size of the American birds in proportion as their birthplace is more southern, and also that there is a similar difference existing between the animals of the higher and lower altitudes. He also finds that with the more southern locality of summer abode there are corresponding differences in color and proportion, as well as in habits, notes, and song, the vivacity of the bird decreasing as its size increases. The principal difference in color with the more southern localities consist in the darker tints and the reduced extent of any white markings, with other features that our space will not permit us to give at the present time. The entire work is one eminently worthy of careful study, and is destined to exercise a very important influence upon the methods of zoological research.—*Bull. M. C. Z.*, II., 3, 1871.

INJURY TO THE FLORIDA CABLE BY SEA TURTLES.

When ocean cables were first submerged, various apprehensions of probable injury were entertained, some of which have proved to be well founded, and others less so. It was supposed that worms or mollusks would burrow in the substance of the envelope, and ultimately penetrate to the centre of the wires; or, again, that the attachment of barnacles, mollusks, or other marine animals on the exterior would invite the at-

tacks of the sharks, rays, and other fish of powerful jaws, and induce them to subject the bunch of matter to such a mastication as should produce serious harm to the cable. To what extent any accidents have happened from this source it is perhaps difficult to say; but we now learn that the Florida cable, between Punta Rosa and Key West, has been injured in numerous places, as supposed by sea turtles biting through or crushing it in their teeth, to such an extent as to destroy its continuity. It is, perhaps, a question whether the turtle be chargeable with these operations; and we think it is quite as probable that, under the circumstances, some ray or other fish has attacked it, and for the reasons already suggested. —8 *A*, *August*, 1871, 149.

INJURY TO THE CHINA SUBMARINE CABLE.

Attention has been called to injuries to the Florida submarine cable, supposed to have been caused either by the bites of the sea turtles or from some kinds of fish; and we now learn that in China a similar difficulty has been experienced in consequence of the attacks of a minute crustacean. This is so small as scarcely to be appreciable to the naked eye, but can be readily defined under the microscope. Various breaks have been satisfactorily referred to the agency of these animals, which had imbedded themselves in the gutta-percha. It has become necessary, therefore, to envelop the cables in certain localities with an external supplementary layer of metallic wire, in order to prevent injury in this manner.—1 *B*, *October* 15, 1871, 21.

DARWIN'S COLLECTIONS IN NATURAL HISTORY.

According to the Athenæum, Mr. Darwin has presented to the University of Cambridge a remainder of the collections in invertebrate zoology made by him during the celebrated voyage of the *Beagle*. These will form a desirable addition to the treasures which the museum of the university is rapidly accumulating under the superintendence of Professor Alfred Newton. The museum has for some time been in the possession of the collections of Mr. William Swainson, embracing a large number of types of his descriptions of new species of birds. The extensive collection of birds and eggs of Western North America of the late James Hepburn, a gen-

tleman well known to naturalists of the United States, has also lately come into the possession of the same establishment.—15 *A, April* 29, 1871, 530.

EXPLORATIONS OF YACHT NORNA.

Among other interesting communications to the late meeting of the British Association is one by Mr. Kent upon the zoological results of the dredging expedition of the yacht Norna, off the coast of Spain and Portugal, in 1870; great credit being given to her owner, Mr. Marshall Hall, for thus utilizing a summer's excursion in the interest of science. Many interesting collections were obtained, embracing new forms of the group of silicious sponges, to which *Euplectella*, or "Venus's flower-basket," and *Hyalonema*, or the "glass rope sponge," belong. These were obtained at from 400 to 800 fathoms, off Cezimbra, at the mouth of the Sado River, and included specimens of *Hyalonema* scarcely to be distinguished from the well-known Japan species. A species of *Fusus* (*F. contrarius*) was found, identical with a common fossil of the Norwich Crag, and other invertebrates obtained more nearly related to Japanese and Chinese species than to any known Atlantic or Mediterranean forms.

The material obtained during the cruise was readily separable into two portions: the first, that collected from the shore-line down to a depth of 100 fathoms, which presented an interblending of Mediterranean species with those inhabiting a more temperate coast of Europe; the second, embracing those taken at a depth of more than 400 fathoms, remarkable for their northern or colder water character and affinities.

It is much to be desired that some of the owners of the many powerful steam and sailing yachts in the United States may be induced to follow the example of Mr. Hall, as the field of exploration outside of a few miles from shore, along the Atlantic coast, is almost entirely unworked, with the exception of what has been done by the United States Coast Survey—and this, however rich in results, covering but a small portion of the ground. During the summer season a week or two might be spent off the coast, at a distance varying from twenty to a few hundred miles, with perfect ease and safety; and by means of apparatus costing but little, and with the companionship of some man of science, always read-

ily obtainable, it would be a more rational occupation than that of junketing in harbors, or sailing races for the mere purpose of ascertaining which of several boats is the swiftest. —13 *A*, *August* 15, 1871, 401.

MOLLUSCA OF THE GULF OF SUEZ.

Mr. R. M'Andrew, a well-known English conchologist, has been occupied for a considerable length of time in dredging in the Gulf of Suez, and has obtained no less than eight hundred and eighteen species of mollusca. Of these, three fourths have been determined. These specimens show a remarkable difference from the forms belonging to the Mediterranean, and the existence is inferred of a barrier between the two seas from a very remote epoch, although it is thought that the two were united in the eocene and miocene periods.

ZOOLOGICAL STATION IN THE GULF OF NAPLES.

The Gulf of Naples has long been a favorite field of exploration for marine zoologists on account of the great variety of animal life to be found in its waters, but much inconvenience has usually been experienced by foreign naturalists for want of the facilities necessary for prosecuting their researches. To obviate this, Dr. Anton Döhrn, of Stettin, an eminent conchologist, has lately obtained permission from the authorities of the city of Naples to erect in the Villa Reale, close to the sea, at his own expense, a large building, to contain a great aquarium for the public, and extensive and convenient apartments for the use of naturalists of every country, the whole to remain his absolute property for thirty years, and as long after that as he may live. Dr. Döhrn proposes to establish himself in the building, with several other German naturalists, and to conduct the administration of the entire establishment. He will there, at all times, be happy to welcome his scientific confrères, and to see that every facility for research is offered them. Some income will doubtless be derived from fees for admission of the general public to the aquaria, and all deficiencies will be made up by Dr. Döhrn, who is understood to be that *rara avis*, a naturalist of means.

An annual report of receipts and expenditures, as well as of the discoveries made in the establishment, is to be made to an international committee, of whom are already named

Helmholtz, Dubois-Reymond, Huxley, Darwin, Hæckel, Leuckart, Von Beneden, etc. He has also invited Professor Agassiz to accept the representation in the committee for the United States, and thereby add the weight of his powerful name. Work on the building will begin forthwith under Dr. Döhrn's direction, his address at Naples being to the care of Friedrich Stolte, Consul General of Germany, Piazza Medina.

In the Northern United States the richest marine fauna is to be found in the vicinity of Eastport, Maine, the adjacent region of the Bay of Fundy having become classic ground through the labors of Stimpson, Verrill, Packard, Morse, Webster, Hyatt, etc. It is whispered that Mr. J. E. Gavit, of New York, president of the American Bank-note Company, and at the same time an eminent microscopist, has it in contemplation, with some friends, to erect a building at Eastport, to be suitably endowed and maintained for the use of any naturalists who may wish to avail themselves of the facilities it may afford. We can only hope that so excellent an idea may be realized at an early day.

DIVISION OF THE SEA-BOTTOM INTO FAUNAL REGIONS.

Professor Möbius, in his "Fauna of the Bay of Kiel," remarks that the sea animals of that locality may be divided into those of the region of the sandy shore—the green sea-grass (eel-grass), the decayed, rotting sea-grass, the red algæ, and the black mud; and he considers that this is a fair type of the physical character of similar bodies of water. It is in this black mud, resulting from the decomposition of the grasses, that the greater number of animals harbor, and upon which they feed, furnishing, in turn, subsistence to the various forms of carnivorous animals. The quantity of organisms occupying such a muddy bottom is perfectly startling, since single casts of the dredge will bring up almost living masses of cases of worms, crustaceans, etc., and it is upon these that large numbers of our coast fish feed almost exclusively.—19 C, *August* 19, 1871, XXXIII., 265.

MOLLUSCA OF GASPÉ.

In the course of an investigation during the season of 1870, the marine fauna of the peninsula of Gaspé, in the Gulf of St.

Lawrence, Mr. Whiteaves, of Montreal, added largely to the knowledge of the mollusca of that region, as he collected one hundred and eighteen species of marine shells, or nearly double the number previously supposed to exist in that vicinity.—*Canadian Naturalist*, V., 217.

NEW GULF STREAM CRUSTACEANS.

According to a recent report by Dr. Stimpson upon the crustaceans dredged in the Gulf Stream by Count Pourtalès, of the Coast Survey, 81 species, of 47 genera, were obtained, of which 52 of the species and 19 of the genera are to be considered as new. Only a small proportion of the species were from great depths, 15 alone being recorded as coming from below 100 fathoms. The greatest depth at which any of the species were found was 150 fathoms, these belonging to the family of the *Portunidæ.* The portion of Dr. Stimpson's report on the brachyurous crabs of this collection has just been published in the Bulletin of the Museum of Comparative Zoology at Cambridge, already so well known for the merit of its zoological memoirs, and the remainder will follow at no distant interval.—7 *D, February*, 1871, 144.

VERRILL'S EXPLORATION IN NEW JERSEY.

Many of our readers are familiar with the names of Mr. Thomas Say, of Philadelphia, and Mr. C. A. Lesueur, as having been among the most prominent of our naturalists during the earlier part of the present century, and as having added many new species to the lists. The labors of Mr. Say were directed largely toward the invertebrata, embracing more particularly the insects, shells, and crustaceans. Many of his explorations were in the vicinity of Beesley's Point, New Jersey, where species were obtained by him that have ever since remained almost unknown to science. Several examinations have been more recently made on the New Jersey coast for the express purpose of recovering these forms, and one of the most successful was prosecuted last spring under the direction of Professor Verrill, of Yale College, who, with several companions, spent a week at Somers's Point and Beesley's Point. The results of their labors were much greater than they had anticipated, as they not only obtained a large proportion of all the missing forms, but secured quite a number

of new species, and detected the occurrence, for the first time, of others previously known as belonging much farther south, among them two echinoderms, of which Cape Hatteras was the limit previously ascertained. Their "catch" for the week summed up 175 species of marine animals—about 25 of fishes, 50 of crustaceans, 25 of worms, 50 of mollusks, and 15 of radiates and sponges.—*Letter.*

DR. STIMPSON'S EXPLORATIONS IN FLORIDA.

Reference was made some time ago, under the head of "Explorations in Florida," to the presence in that state during the past winter of Dr. William Stimpson, the well-known naturalist, and Secretary of the Chicago Academy of Sciences. This enterprise deserves more than a passing notice in consequence of its magnitude, and the thorough nature of the examination made of the marine fauna of the Southern coast. The work was instituted in the interest of the Academy of Sciences of Chicago, and the funds supplied by the liberality of Mr. Blatchford, of that city, who accompanied the expedition, and did all in his power to make it a success. A fast-sailing schooner, with three boats and seven men, were engaged at Key West, and the work began about the middle of February. The entire length of the Florida reef, and the Keys from Cape Florida to the Tortugas, a distance of two hundred miles, was thoroughly examined, and dredging was prosecuted both in the reef channel and in the Gulf Stream outside. A large collection of fishes was made, including some new species, and over fifty species of shells were found not hitherto reported from the Florida coast, although known in the adjacent West Indian seas. Large numbers, however, of entirely new species, both of mollusks and other invertebrates, were collected, which will be worked out and published at an early day. The total amount of collections made filled sixty-two barrels and boxes, weighing about three tons.* The alcoholic series would have been much larger but for the high price of alcohol at Key West. The collections thus made by Mr. Blatchford and Dr. Stimpson will add greatly to the already rich cabinet of the Chicago Academy of Sciences—an institution which has assumed a high rank among

* We regret to say that all these collections were destroyed in the great Chicago fire.—*Editor.*

sister establishments. The Academy is the fortunate possessor of several nearly complete skeletons of the mastodon, and has just obtained one of an Indian elephant that died not long since in the vicinity of Chicago.

AMERICAN TAPIRS.

We learn that the Smithsonian Institution has recently succeeded in obtaining two complete skeletons of the remarkable tapir of the high lands of the United States of Colombia, known to naturalists as *Tapirus pinchaque* or *roulini*. Previously only the skull had been obtained by Roulin, by whom it was first made known, and it was one of the rarities of the great anatomical collection at Paris. The Smithsonian Institution had before obtained a number of skulls, and a skeleton of the still more remarkable tapir of Panama, which had remained undistinguished from the common species of Panama till within a few years, when first described, under the name of *Elasmognathus bairdii*, by Professor Gill, from two skulls in the Smithsonian collection. There are no external or dental differences between the tapirs corresponding with the marked differences in the skulls; the external differences being confined to the contour of the forehead, the color, and the character of the hair. In the mountain tapir, as might be expected in an animal dwelling in such elevated regions, the hair is long and coarse, and is of a black color, strongly contrasting with that of the common tapir of South America; it is also somewhat smaller than that species, and has the forehead less arched from the occiput. It is confined to the highlands, and is separated, at least as far as is known, by quite a wide band of country from the common species.

SCHOOLS OF YOUNG BLUEFISH.

For three days during the last week in December, 1871, vast schools of small bluefish were noticed in Beaufort Harbor, North Carolina, in company with fat-backs and yellow-tailed shad, apparently slowly working toward the sea by the route of the Inlet. They were coming from the southward through the Sound, and swam very slowly, at times nearly leaving the Sound and then returning. Efforts made to capture some were unsuccessful. Their size, as estimated (leaping from the water), was four inches; some much smaller.

H. BOTANY AND HORTICULTURE.

TREE-PLANTING ON THE PRAIRIES.

M. R. S. Elliott, industrial agent of the Kansas Pacific Railway, has been experimenting upon the cultivation, upon the plains, of various seeds without accompanying irrigation, the principal trials having been made at three stations along the railroad: the first, Wilson, being 239 miles west of the state line, and 1586 feet above the sea level; the second, Ellis, 302 miles west, and of 3019 feet elevation; and the third, Pond Creek, 422 miles west, and 3175 feet in altitude. Trials were made, in these experiments, of winter grains, as wheat, barley, and rye; of spring grains, as wheat and oats; of various grasses; of tree seeds, such as ailanthus, chestnut, piñon, elm, etc.; and of various fruit trees. The conclusions arrived at from these investigations were, that lucerne and other valuable forage plants, winter and spring grains, and trees, may be grown on the plains from seed, without irrigation, as far west as the 100th meridian, and perhaps even further; also, that trees may be grown from seeds, cuttings, and young plants, for timber or for fruit, in all parts of the plains between the Platte and the Arkansas Rivers; and, finally, that the growth of living storm-shields along the line of the Kansas Pacific Railway, and of timber for the uses of the road, is only a matter of effort and time.—*Circular of Elliott.*

EFFECT OF TREES ON CLIMATE (MALTA).

Much has been said in the work of Mr. George P. Marsh, entitled "Man and Nature," and by many other writers, of the influences exerted by man upon the physical condition of the earth and the atmosphere, and deserved stress has been laid upon the important part played by trees in all phenomena connected with the amelioration of climates and the restoration or increase of rain-fall, and the diminution in the number and the intense severity of inundations, etc. Mr. Buchan, a well-known meteorologist of Edinburgh, has made a report to the Scientific Society of that city in regard to certain measures about being introduced by the Governor of

Malta for replanting the island with trees, in which he remarks that the characteristic features of the climate of that island are the cold northerly winds of the winter, and the excessive heat of summer, with a great scarcity of water throughout the whole year. The entire absence of trees on the island was thought to intensify and increase these extremes, and it was believed that by securing an abundant covering of forests much could be done for the amelioration of the climate. Mr. Buchan, in reference to the general theory of such amelioration, states that while the highest temperature of the air occurs in summer between two and three o'clock P.M., the change in the trees is very slow, the leaves not attaining their maximum temperature until nine o'clock P.M. Thus, while the atmospheric changes are rapid, the temperature varies slowly in the trees, and therefore they serve, like the ocean, as equalizers of the temperature, moderating the heat of the day, and maintaining a higher temperature during the night.

In continuation of the same subject, Mr. Buchan remarks that, as air is heated by contact with the soil, and as trees shelter the soil from the solar radiation, they must diminish the force of the sun's rays, especially in the lower strata of the atmosphere. The exhalation of moisture by trees produces cold in the air by abstracting the latent heat from it. This lowering of the temperature gives to the air a greater degree of humidity. Again, the leaves of trees exercise an important influence in cooling the atmosphere, as the tree itself, by its radiation of heat, becomes sensibly lower in temperature, and thus cools the air as it plays among the leaves. —18.*A*, *February* 17, 514.

SUPPOSED NATURAL ORIGIN OF SOME FOREST FIRES.

The great frequency of fires during summer in the pine forests of Germany and France, under circumstances where there was no suspicion of accidental or willful incendiarism, has suggested to Mr. Schrader the idea that these may possibly be in a measure spontaneous. In most of these forests the resin is collected in large quantity from punctures made in the bark, and an exudation of the same substance may take place whenever the bark is accidentally cracked. Mr. Schrader suggests that the tear-shaped drops of resin, in running from the tree,

may form lenses, through which the rays of the sun may be concentrated, and act upon the inflammable surroundings, and thereby set fire to them. In many cases, possibly, a vapor of escaping turpentine may also, by its combustibility, cause the fire to spread with greater rapidity.—1 *B*, *Aug.* 14, 114.

THE AILANTHUS-TREE.

The disagreeable smell of the ailanthus-tree while in blossom need be no objection to the planting of it on a large scale as a timber tree, since, as is well known, it is diœcious, and the male tree alone possesses the unpleasant peculiarity. It is only necessary to propagate the female tree, therefore, in order to have an equally fine grove without the practical inconvenience referred to. It so happened that, on the first introduction of the tree into this country, the male tree alone was propagated. The female, however, is coming more rapidly into use, and may readily be known by the clusters of seeds it bears, similar to those of some species of the ash family.

There are few trees more valuable for timber than the ailanthus. The wood has much of the same properties as the chestnut, and is equally durable, grows with as great rapidity, and in its native country obtains a height of between two and three hundred feet. It is said to be well adapted to growth on the Western prairies, and will undoubtedly perform an important part in clothing them with forest vegetation.

CINCHONA IN JAVA.

According to Professor Hasskarl, the cultivation of cinchona in Java continues to be a success, the weather having been favorable and the growth of the plant perfectly satisfactory. The number of plants obtained from seeds and layers was about one and a half millions, principally of the species *C. calisaya;* eight hundred and seventy thousand were transplanted in addition, and over one thousand pounds of the dry bark were sent to Holland in 1869, bringing from thirty-six to fifty-four cents per pound. The total product of 1870 is estimated at eight thousand eight hundred pounds for exportation, besides some hundreds for home use in the island.—12 *A*, *December* 8, 1870, 114.

CULTIVATION OF THE CINCHONA-TREE IN ALGIERS.

The British government has, it is well known, been very successful in cultivating the cinchona plant in its colonies, and it is now stated that a similar experiment has been made by the French in Algiers with equally satisfactory results. The plants were reared in a hot-house in France, and the soil kept uniformly and moderately damp, this appearing to be one of the conditions essential to success. As the heat of the sun became more powerful the development was more rapid, especially in those plants nearest the glass. About the end of June the plants were transferred to the open air, and remained exposed to the sun until the end of September, when they were taken to Algeria, where they are said to be now doing well.—2 *A*, *August* 6, 88.

CULTIVATION OF THE CINCHONA-TREE IN JAMAICA.

In view of the fact that the cinchona-tree, from which Peruvian bark and quinine are obtained, is becoming rapidly exterminated in South America, in consequence of the reckless manner in which the bark is gathered, it is gratifying to learn that the efforts of the British government to cultivate the plant artificially in its colonies are meeting with so much success. Large plantations are now profitably cultivated in India and Ceylon, and we learn that the experiment in Jamaica, lately commenced, has proved entirely satisfactory. The plants were first introduced into that island in 1866, and had increased to such an extent by the close of 1867 that it became necessary to set them out on a large scale. For this purpose six hundred acres were prepared in the Blue Mountains, at an elevation above the sea of from four thousand to six thousand feet, where the soil is said to be admirably adapted to the requirements of the plant. Forty acres were first cleared and filled with the cinchonas in the course of a year, about twenty thousand plants, of five different species, being set out. These are said to have stood one of the dryest seasons ever known on the island without suffering in the least, and there seems to be no doubt that the plant can be successfully reared in Jamaica.—17 *A*, *July*, 99.

THE EUROPEAN PLANE-TREE IN CITIES.

No tree resists so well the smoke and impure air of European cities as the plane (*Platanus occidentalis*), although it is not a native of that continent. It is the tree most generally seen in the church-yards, squares, and other open spaces in London, thriving well, and living to a considerable age. This is probably in part due to the fact of the outer layer of bark being shed yearly, and thus not becoming choked with smoke so that its functions are destroyed. The rows of young plane-trees planted along the recently opened portion of the Thames embankment, from the Houses of Parliament to Charing Cross and the Temple, are growing vigorously, and promise in a few years to afford a grateful shade, and to add much to the beauty of the banks of the river.

NEW FODDER PLANT.

A new kind of fodder plant (*Gymnothrix latifolia*) has recently been introduced into France from Uruguay. It is not unlike the sugar-cane in appearance, grows eight or nine feet high, and is said to make excellent fodder either when green or cured.—9 *C*, 1871, III., 21.

NEW MILK-PRODUCING TREE.

A new milk-producing tree in the Valley of the Amazon has recently been brought to the notice of Europeans. It is known as the *Massaranduba*, and appears to be a species of *Mimusops*, of the natural order *Sapotaceæ*. The wood is valuable, and used for various purposes, and the milk flows freely from the trunk upon incision, but hardens on exposure to the air, and then has an elastic property similar to that of gutta-percha. This juice is used as food when fresh, but never in its pure state, being either mixed with a small quantity of water, or with coffee or tea like ordinary milk.

ETYMOLOGY OF THE NAME "HORSE-CHESTNUT."

Considerable speculation has been expended in regard to the derivation of the term "horse-chestnut," any apparent connection between the fruit and the animal being, to say the least, very remote. It is now suggested that the name was originally "harsh-chestnut," as expressive of its peculiar bit-

ter, acrid taste. The same derivation is also given for the horse-radish. Another equally plausible derivation is that of the term "horse" being applied to indicate some unusually large and strong form, as the horse-clam, etc.—12 *A*, *August* 4, 277.

CARBOLIC ACID FROM ANDROMEDA PLANT.

It is stated that carbolic acid has been obtained from a species of *Andromeda*, occurring in the Neilgherry Hills of India, and that, being less deliquescent and far more pure than ordinary carbolic acid, it may be made to serve as a substitute in delicate medical cases. The discovery is considered one of importance by the East Indian government, and measures are proposed for utilizing it on a large scale. We have many species of this same genus in North America, but it is questionable whether, in the abundance of cheaper sources of supply, it would be a profitable business to go into the manufacture.—6 *D*, *May* 20, 622.

DWARF RAGWEED.

At a meeting of the Academy of Natural Sciences of Philadelphia, Mr. Thomas Meehan exhibited a small plant of the common ragweed, *Ambrosia artemisiæfolia*, which had grown in a pot in his hot-house. The plant, little more than an inch in height, was already provided with fertile flowers and also bulblets. He remarked that it was a common impression that when land was put down in grass the ragweed disappeared, but that after an unlimited number of years, when the ground was broken up, the weed reappeared, as supposed from the development of seeds which had long remained in a dormant condition. If such pigmy plants as the one exhibited can perfect seeds, it is evident that a multitude of them might perpetuate themselves among the grass unnoticed from year to year, until, under favorable circumstances, a crop is produced which becomes conspicuous from their size. Thus their occurrence may be explained without the necessity of an indefinite extent of vitality.—2 *D*, 1871, *May* 16.

ORIGIN OF MAIZE.

The claim that the maize, or Indian-corn plant, is indigenous to the soil of the New World, has lately been contested, and recent investigations of certain Chinese records are cited to prove that it was cultivated in China prior to the discovery of America. Chinese authors maintain that it came originally from countries west of China, and that it was introduced into that country long before the first arrival of the Portuguese in 1517.—15 *A*, *June* 24, 1870, 841.

USES OF THE "WATER-PEST" PLANT.

Much alarm has been caused in Europe by the spread of a certain plant, living in running water, called the water-pest (*Elodea canadensis*), and said to have been introduced from America. By its very rapid growth it speedily chokes up the channel-ways, thus impeding the flow of water in mill-races, and interfering also with fishing. A recent German writer, however, finds consolation in the fact, which he thinks he has ascertained, that this "water-pest" exercises a very important function in purifying the water, and that, if planted in streams which form the drainage of sewers, it will take up entirely and destroy any disagreeable smell, as also the noxious properties of ordinary sewerage. The composition of its ashes is said to be extremely complicated, and the plant itself is recommended as furnishing a manure of the greatest value. It has also been tried with success in paper-making. There is no doubt of its value as food for the herbivorous fishes, such as the carp, etc., and it will probably yet be cultivated for this purpose.—16 *C*, II., 28.

THE COMPASS PLANT.

Many travelers and residents in the West have called attention to a peculiarity of the so-called "compass plant" (*Silphium laciniatum*), of the Western prairies, which is alleged to possess the remarkable tendency to have the plane of its leaves directed north and south to such a degree that these points of the compass can readily be determined from their examination. This statement has, however, been contradicted by others, who are unable to find any tendency of the kind in question. In a recent paper by Mr. Meehan, of Phila-

delphia, the discrepancy is reconciled by stating that the peculiarity is only appreciable in the young plants and when they first come up, since, after becoming large and heavy, they are moved out of place by the wind and rain, and unable to regain their original position.—2 *D*, *October*, 1870, 117.

ORANGE FUNGUS OF BREAD.

At a meeting of the Academy of Sciences of Paris, specimens of bread, baked for the use of the army, were exhibited, which had been rendered entirely unfit for food by the development of a yellowish-white substance, changing gradually to an orange-red color, and emitting a nauseous odor. Considerable agglomerations of this substance were formed, so as to fill all the cavities of the loaf. When examined by the microscope, this appearance was found to be due to the presence of a cryptogamic plant, already described as *Oidium aurantiacum*, and which was observed in the bread in Paris in the summer of 1843, and at a later period at Marseilles and in Algeria. The sporules of the *Oidium* were found to adhere to the husk of the wheat, and were probably abundant in proportion as this was in a humid state, badly cleansed, and had undergone alteration from the larvæ of the weevil, as it never occurs in bread of the best quality, carefully prepared.—20 *A*, *Sept.* 2, 288.

NATURE OF COAL.

Some time ago Professor Huxley announced his impression that the spore-cases and the spores of coal plants, rather than the material of the stem, had been largely or mainly instrumental in the production of coal. Dr. Dawson, of Montreal, in a recent paper in the American Journal of Science, takes occasion to present the result of a careful inquiry into this subject, in which he comes to the conclusion that these sporangic bodies are exceptional among coals, and that the cortical and woody matters are the most abundant ingredients in all the ordinary kinds.—4 *D*, 1871, *April*, 260.

HUGE FOSSIL ALGÆ.

It is stated that certain specimens of supposed fossil wood, considered by Professor Dawson, of Montreal, as the oldest

known instance of the occurrence of the conifera, have proved to be really stems of huge algæ, vastly exceeding in size the ordinary algæ of the present day. It is said, however, that there are forms in the antarctic seas that exhibit the nearest approach to them, some of these being twenty feet high, and as thick as a man's thigh. These have not unfrequently been collected by mariners in those seas as fuel, under the belief that they were drift-wood.—13 *A*, *Oct.* 22, 16.

FUCUS SERRATUS IN NORTH AMERICA.

The announcement is made in the *Canadian Naturalist* of the discovery by Mr. Camp, on the shores of the harbor of Pictou, Nova Scotia, of living specimens of a species of sea-weed known as *Fucus serratus.* This plant, though known upon the shores of Northern Europe, had not been authenticated, at the time of the publication of Dr. Harvey's work on the American sea-weeds, as occurring in North America, and botanists will be interested to learn that it is actually found on this side of the Atlantic. The specimens referred to were cast on the shore with other sea-weeds, and others were subsequently found growing sparingly, attached to the rock. It is, however, thought not improbable that the plant may have been brought in ballast by British ships, and that it is not actually a native of the New World. Its occurrence at Marblehead, if the statement be correct, would, however, militate against the latter idea.—*Canad. Naturalist*, *Sept.*, 1870, 351.

MURRAY ON BLIGHT IN PLANTS.

At a meeting of the scientific committee of the Horticultural Society of London, Mr. Andrew Murray read a paper on the blight of plants, in which he combated the ordinary theory that the lower forms of vegetable organisms, which constitute ordinary blight, are developed from germs existing in the plant or floating in the air.—12 *A*, 89, *July* 13, 210.

NEW DISEASE OF THE COFFEE-PLANT.

According to M. J. Berkeley, a disease has lately appeared in the coffee plantations of Ceylon which threatens to become of serious import. The albumen of the berry is developed sufficiently to present the usual convoluted appearance, but the growth appears to be suddenly arrested. As a re-

sult, the substance is not sufficiently solidified, and consequently it contracts and acquires a dusky tinge, in some cases becoming black. No indications of fungi were observed by Mr. Berkeley. The disease has been attributed to sudden changes of weather, and it is thought to be possibly of no more than local development.

MANGANESE IN BEECH-NUTS.

It has lately been ascertained, in corroboration of experiments made some years ago, but to which little importance was attached, that beech-nuts contain a large percentage of manganese, although the soil in which they are grown may exhibit no appreciable trace of this metal.—16 *A*, *July*, 1871, 402.

NITROGEN IN MULBERRY LEAVES.

Some important investigations were prosecuted, not long since, by Dr. Reichenbach upon the chemical composition of the leaves of the mulberry in connection with the silk-worm disease, in the course of which he ascertained that such leaves, as grown in Europe generally, had a much less percentage of nitrogenous matter than those of China and Japan. He has lately continued his inquiries by an analysis of leaves from Turkistan, and has found in these an unusual percentage of nitrogen, varying from 3.35 to 4.05 per cent. in the dry leaf.

In some accompanying remarks upon this paper by Liebig, stress is laid upon the importance of such investigations in determining *à priori* the value of different qualities of leaves for raising silk-worms, and it is stated that where nitrogen is deficient, the silk-worm suffers in its general health, and consequently in its ability to produce a healthy and abundant silk cocoon. The cause of the paucity of nitrogen in the European leaves is believed to be the result of long-continued cultivation of the tree in the same soil, and especially the use of leaves from trees that have attained their full size. In a growing plant, as the roots are perpetually pushing out into new and unexhausted soil, the proper supply of nourishment is obtained; but the moment a complete development of the tree is accomplished a diminution of nitrogen in the leaves commences, with the results indicated; so much so

that a yield of even $2\frac{1}{2}$ to 3 per cent. of nitrogen from the dry leaves is not common.—14 *C*, C., 326.

POISON FROM THE SHADE OF THE MANZANILLA.

Mr. Karsten has published the detail of observations made upon himself in reference to poison by exposure to the shade of the manzanilla-tree (*Hippomanes manzanilla.*) After remaining several hours under the tree, he experienced a burning sensation over the entire surface of his body, which at length centred in certain parts of the skin, especially about the face, and above all around the eyes. After a time the eyes were swelled so as to be almost closed, and were so sensitive that for several days he found it necessary to remain in a perfectly-darkened room, being also in great pain. After three days the swelling diminished, and the epidermis began to peel off. These symptoms he supposed to be the result of poisonous exhalations from the tree, a peculiarity which is shared with the manzanilla in South America by several other species of plants. An analogue of these deleterious exhalations may be seen in certain volatile organic bases, such as trimethylamin; and it is suggested that similar nitrogenous combinations may have a much wider distribution than has hitherto been suspected.—18 *C*, 1871, *July* 19, 453.

TRANSPIRATION OF LEAVES.

Von Pettenkofer, in the course of his researches upon the amount of evaporation which takes place from the foliage of plants, ascertained in the case of an oak-tree that this increased gradually from May to July, and then decreased till October. The number of leaves on the tree were estimated at about 751,600, and the total amount of evaporation in the year at 539 cubic centimetres of water for the whole area of the leaves. As the average rain-fall for the same period was only 65 centimetres, the amount of evaporation is thus eight and a half times greater than that of the rain-fall. This excess must, of course, be drawn up by the roots from a great depth. The inference is derived from the above that trees prevent the gradual drying of a climate by restoring to the air the moisture which would otherwise be carried off by drainage.—13 *A*, *February* 1, 120.

ACTION OF LIGHT ON THE TISSUES OF PLANTS.

According to Botalin, notwithstanding the many experiments that have been made in regard to the physiology of vegetation, little or nothing has been determined as to the action of light upon the tissues of plants. This gentleman has, consequently, occupied himself in prosecuting inquiries in relation to this subject. His memoir, lately published by the Academy of Sciences of St. Petersburg, contains an exhaustive detail of observations and researches on this subject, but our space will permit us to give only a few of the practical conclusions to which he came. Among these may be mentioned the following: Direct sunlight or strong light retards the subdivision of the chlorophyl parenchyma cells, while diffused light favors such a division in the parenchyma cells of the bark. Absence of light has the same retarding effect as strong light. Light has no influence upon the division of the epidermis cells. Strong light, as well as entire darkness, retards the division of the cells of the parenchyma of the bark. The absence of light produces a slight thickening of the parenchyma cells. Light exercises no influence upon the thickening of the cells on the inside bark, and of the wood.—*Mél. Biol. Acad. Sc. St. Petersburg*, 1870, VII., 269.

CHANGING THE COLORS OF THE FLOWERS OF THE HYDRANGEA.

Some of our readers may not be familiar with the readiness with which the color of the flowers of the common garden hydrangea can be altered artificially. If a sixth part of iron filings be mixed with the earth in which the plant is grown, it will frequently, although not always, change from its original pink color to a light blue. A cutting, however, taken from the plant thus changed, and grown without iron filings, reverts to its previous color.—6 *A*, 1870, *July* 16, 81.

GENERATION OF HEAT BY FUNGI.

The statement of Dutrochet that a considerable amount of heat is generated by fungi during the process of growth, as well as of decomposition, has been substantiated by Mr. Smith, who found it to be greater in the species of *Boletus æneus* than in any other plant excepting the *Arum*. In one

instance, where several specimens of *Boletus* were packed in a box, it was found that the temperature of the air was raised from seventy to seventy-five degrees, an increase readily apparent to the hand.—12 *A*, *September* 8, 380.

ARE FROZEN PLANTS KILLED IN FREEZING OR IN THAWING?

The question whether a plant killed by frost is destroyed while freezing or during the subsequent thawing is one that has excited considerable interest on the part of physiologists, who have, however, in vain endeavored to answer it. Quite unexpectedly, a method has been placed at the command of experimenters that enables them to solve the problem satisfactorily. In some tropical countries plants of the genus *Phajus* and *Galanthe* have long been known to contain indigo; this, while they are living, being in the form of indigo-white, or indigotin, the blue color exhibiting itself only after death. If, for instance, the milky-white flowers of the *Galanthe* be crushed in the hand, they become instantaneously blue, furnishing an excellent opportunity of showing the relationship between indigo and indigotin. If, now, these flowers be frozen, they immediately assume the blue color of indigo, appearing at first a pale blue, then darker, the pollen masses alone retaining their natural yellow color throughout. The cold air supplies the place of a reagent, and is, indeed, more sensitive than any other that chemistry can produce. The flower-stems, with their white bracts, are also changed into blue. These experiments, more or less modified, have been applied repeatedly to the plants mentioned, and to others allied to them, and always with the definite result of proving that death occurs during the freezing, and is not deferred until the thawing out. Similar changes of color are produced on these plants by such chemical agencies as cause death in whole or in part, as by immersion in sulphide of carbon, ethereal oil, ether, etc. Concentrated solutions of hydrochlorate of morphia and nitrate of strychnine do not, however, cause this change, showing that they have comparatively little noxious influence upon plants.—1 *C*, XXVI., 1871, 412.

CIRCULATION IN PLANTS.

In conducting experiments upon the transpiration of fluid by leaves, it is a matter of importance to determine the ra-

pidity of ascent of the fluid. Professor Church suggests for this case the use of lithium citrate, a salt easily taken up by plants, and one which can be detected with the greatest readiness by means of the spectroscope. Its advantages consist in its containing an organic acid, and in not being likely to meet with any obstruction to its passage from the tissues. An experiment has lately been made with this liquid, as suggested, with great success; in one instance the fluid having risen nine inches in thirty minutes, in another five and a half inches in ten minutes. This is thought superior to the use of coloring matters, which seemed to experience considerable resistance in their passage through the vessels.—12 *A, October* 27, 1870, 515.

INJURY TO VEGETATION FROM GAS.

It is by no means an uncommon assumption that illuminating gas, in escaping from pipes into the soil, exercises a poisonous influence upon vegetation, and a suit was recently brought at Aix-la-Chapelle by the city authorities against a gas company for recovery of supposed damage to the shade-trees of the city resulting from their careless method of laying the pipes. This was the cause of a detailed series of experiments in regard to the assumed fact, and, somewhat to the surprise of every one, it was ascertained that purified illuminating gas had really little or no injurious effect of the kind asserted. The experiments were conducted by eminent chemists, and included trials with pure hydrogen, light carbureted hydrogen, and heavy carbureted hydrogen, as well as purified illuminating gas. A discharge, during an entire day, of these various gaseous substances into the soil of vessels containing growing plants was found to produce little, if any, hurtful result. It was different, however, when these same gases were impregnated with the constituents of coal tar, especially with carbolic acid, in which case, after a few days, a very decided injury to the vegetation was found to have taken place. The effect seemed to be that these impurities, coming in contact with the roots of the plants, deposit tarry matter upon them, which ultimately caused death by a kind of asphyxia. The smallest quantity of carbolic acid was found to have a very decided influence, so that the principal caution to be observed, as far as injurious results are con-

cerned, is to see that the carbolic acid is entirely eliminated. In one experiment a discharge of gas was allowed to take place for three hours daily for a period of an entire year, and the effect, if any thing, was to secure a fuller development of the plant.

All that those experiments appear to prove, however, is that perfectly pure illuminating gas is not injurious to the roots of vegetation, the fact remaining demonstrable that ordinary gas does have a marked noxious effect. The elaborate communication in 1858 to the Philadelphia Academy of Natural Sciences, by Mr. Fahnestock, shows this very clearly in a case where the contents of a large green-house were destroyed. In another instance, a stroke of lightning, passing along the street gas-mains in Racine in 1867, disturbed their joints and caused a leakage which resulted in the death of nearly all the shade-trees along an entire square.—15 *C*, 1870, 86.

DRYING FLOWERS, ETC.

A method in use on the Continent of Europe for drying herbs, flowers, etc., and keeping them in drawers free from moisture, especially in damp weather, may be applied not inappropriately to the preservation of certain objects of natural history, especially prepared plants and insects. This plan consists in inserting a shallow tin pan in the bottom of the drawer, and fitting to it a covering of metallic gauze or muslin. Fused carbonate of potash is to be placed in the pan, and the objects are allowed to rest on its porous cover. Rose-leaves and other delicate substances may be dried in this way without losing any of their perfume. Where the material to be dried contains much water, it is necessary to change the carbonate of potash occasionally, and to remelt it. In addition to the apparatus mentioned, the drawer should have a tightly-fitting lid on top, so as to close it more completely.—14 *A*, 1870, 358.

PREPARATION OF WOODEN LABELS FOR PLANTS.

Wooden labels for plants, to be inserted in the ground, may, it is said, be preserved for an indefinite time by first dipping them in a solution of one part of copper vitriol and twenty-four parts of water, and subsequently immersing

in lime-water or a solution of gypsum.—6 *C, July* 14, 1870, 282.

PITH OF WOODY MATTER.

Mr. A. Grès, in a recent memoir upon the pith of woody plants, endeavors to show that this pith, in the dicotyledonous species, is not simple and uniform in its organization, as has been supposed, but that it is capable of furnishing appreciable characteristics for a natural classification. He finds that it preserves its vitality for many years, sometimes even to a very advanced age, and that it contains in one part or other of its cellules a supply of nutritive material in the form of starch and tannin, which is taken up again at the moment of the development of the new verdure in spring. He thinks, also, that it participates with some of the tissues of the wood itself in the nutrition of the plant, and that it fills an important physiological place, being far from drying up after the second year, and thus becoming subsequently only a dead tissue.—3 *B*, xxv., *August* 10, 181.

FERTILIZATION OF THE FLOWERS OF RHODEA.

The structure of the flowers of *Rhodea japonica* is such that fertilization can only take place when the calyx has been gnawed through in some way during the period of blooming. This is accomplished usually by snails, which habitually infest the plant. These creep out along the spathes and gnaw the calyx without injuring the ovary. The mutual relationship between this plant and snails is so close that the cultivation of the one has even been suggested as a means of securing the destruction of the other in a garden, since wherever planted it is sure to be sought out by the snails, which accumulate in quantities upon it, and are readily captured. —1 *C*, 1870, 578.

SORBY ON TINTS OF AUTUMNAL FOLIAGE.

In an elaborate article by Mr. Sorby upon the varied tints of autumnal foliage in the *Quarterly Journal of Science*, he comes to the conclusion that the production of the fine tints of autumn is an evidence of diminished vital powers of the plants. This generalization also agrees with the fact that the unhealthy branches of a tree turn yellow, while the rest

remain green, the subsequent development of more sombre tints being evidence of more complete death. This change may occur without the agency of frost, but is generally brought about prematurely when subjected to the influence of the latter.—1 *A, March* 31, 150.

THE MOVEMENT OF CHLOROPHYL GRAINS.

Dr. B. Frank contributes to the *Botanische Zeitung* some observations on this subject. He confirms the statement of Famintzin and Borodon as to the motion observed in the grains of chlorophyl in the leaves of plants under the action of light, and identifies it with the movements of the protoplasm previously observed by Sachs. The protoplasm alone, he believes, possesses this power of motion, and carries the grains of chlorophyl along with it. It takes place not only in direct sunshine, but also under the diffused light of the sky. Colored rays, as blue and red, also produce decided though less energetic action.

TRANSPIRATION OF WATER BY LEAVES.

In a paper by Dr. MacNab on the transpiration of water by leaves, he states, as the general conclusions reached by his investigations, that the mean of several experiments gave about sixty-three per cent. as the quantity of water contained in the leaves, and that the quantity of water removable by chloride of calcium or sulphuric acid was not equal to that transpired under the stimulus of the sun. About five per cent. of the water was determined to be fluid, in relation to the cell sap of the plant. About three per cent. per hour was given out under the sunlight, a little over half of one per cent. in diffused light, and less than half of one per cent. in darkness. About twenty-six per cent. per hour was transpired in a saturated atmosphere in the sunshine, and twenty and a half per cent. in a dry atmosphere, while in the shade none was transpired in a saturated atmosphere, and less than two per cent. in a dry atmosphere. Leaves immersed in water take up a little over four per cent. in an hour and a half, and it was established that plants absorb no moisture whatever in a state of vapor through their leaves. In light of any kind the under side of leaves was found to transpire much more water than the upper. The experiments of Dr.

MacNab were made upon the laurel cherry (*Prunus lauro-cerasus*), the liquid used for testing the rapidity of the ascent being the lithium citrate.—13 *A*, *February* 1, 120.

INFLUENCE OF AMMONIA ON THE COLOR OF FLOWERS.

An experiment was made by Vogel upon the influence of ammonia upon the colors of flowers, in which eighty-six species and varieties were exposed, under a glass bell, to a mixture of sal ammoniac and lime-water, the fresh flowers being placed at the same height in all the experiments. As a general result, a difference was appreciable between the action of the gas upon the colored matter deposited in granules and that forming a solution, the effect being much less in the former than in the latter. In most cases the changes produced agreed closely with those which the coloring matter of the flowers passed through in the course of withering; and even in natural withering and fading there is the same difference to be observed between the soluble colors and the granules.—19 *C*, *August* 5, 260.

ACTION OF ELECTRICITY ON THE COLORED TISSUES OF VEGETABLES.

In a memoir by M. Becquerel the elder upon the action of electricity upon the colored tissues of vegetables, he remarks that electrical discharges, whether strong or weak, produce three distinct actions upon the colors of the leaves of plants and the flower: First, that by virtue of which the parts electrized allow the coloring matters, which are in a state of solution in the cellules, to be absorbed, or, rather, filtered in cold water, in which they are plunged after electrization. This effect takes place principally with red and blue colors, while the yellow shades, due to the solid granules situated in the cellules, do not appear to be modified. Second, a direct decolorizing action upon red and blue coloring matters, which are found in a liquid state in the cellules whenever the electrization of the plant is sufficiently prolonged, this effect being sometimes very rapid. Third, infiltration, so to speak, or a transfer of coloring matter sensible to the preceding influences, and that found in the interior of the electrized organs. An example is seen in the effect produced in the red, found in the under surface of leaves of the *Begonia discolor*,

its color, during the electrization of the leaf, becoming gradually infiltrated toward the upper green surface, so as to mask the color of the chlorophyl. He farther remarks that the atmosphere and the earth are constantly in two dissimilar electrical conditions, the first possessing an excess of positive electricity, the second of negative, these two excesses becoming neutralized by means of the conducting substances found at the surface of the earth, plants especially.—3 *B*, XII., *July* 20, 660.

WATERING PLANTS WITH HOT WATER.

It has been shown, by careful experiment, that sickly potted plants, even some that have almost died out, can be greatly benefited, and sometimes, indeed, entirely restored to vigor, by applying warm water to them instead of cold. In certain cases, oleanders which had never bloomed, or did so only imperfectly, after being treated with lukewarm water, increasing the temperature gradually from 140° up to 170° Fahr., produced the most magnificent luxuriance of bloom. Similar results occurred with an old plant of *Hoya*, and also with an India-rubber-tree which had nearly withered away. In all these cases the application of water heated to about 110° Fahr., without any other precaution, caused a new and flourishing growth.—8 *C*, *December* 8, 1870, 391.

INFLUENCE OF CONDITIONS OF HEAT ON THE GROWTH OF PLANTS.

A paper has been published by Köppen upon the relationship of conditions of heat to the phenomena of growth in plants, his first inquiry being limited to the questions connected with the germination of the seed. The general conclusion arrived at was that variations of temperature were in all cases prejudicial to the growth of the germ, even when amounting to but a few degrees, and these within limits favorable to energetic growth; that is to say, the germination proceeds more rapidly at a low temperature of a uniform degree than at a higher where subjected to more or less variation. From this we derive the inference that a nearly uniform spring temperature, with a cloudy sky, is more favorable to rapid development of vegetation than the alternation of hot days and cool nights, it being of course understood that

the mean temperature in each case is about the same.—19 *C*, XXVI., *July* 1, 209.

INFLUENCE OF HEAT OF SOIL ON GROWTH OF PLANTS.

The result of an investigation by Bialoblocki, in regard to the influence of the warmth of soil upon the development of certain cultivated plants, is summed up by him in the following words: The influence of warmth of the soil is made manifest in two directions: in the shortening or lengthening of the period of vegetation, and in affecting the external form of the plant, the acceleration of growth of vegetation occurring principally in the earlier periods. With an ascending temperature of the soil, vegetation is forwarded up to a certain point. From the moment, however, when this point is reached, an increase of temperature in the soil actually retards growth. The maximum point of favorable temperature of the soil varies for different plants, but the maintenance of a constant temperature has for its result a more vigorous growth of the plant experimented on. The extreme limit of a constant temperature of the soil at which a growth of the roots can still take place we may assume to be below, but very near 104° Fahr. A ground temperature of 50° Fahr. barely allows plants to fulfill completely all their functions of life and conditions of development. An increased ground temperature has no special influence upon the absorption of nutritious matter through the roots, and the accelerated growth resulting from an increase of heat is usually accompanied by a greater percentage of water in the plant.—18 *C*, XXXI., *August* 2, 486.

GROWTH OF PLANTS IN AQUEOUS SOLUTIONS.

Experiments have been prosecuted of late by German physiologists in regard to the cultivation of plants in aqueous solutions of different substances without the addition of any earth, and, as the general result, we are informed that a plant will grow, bloom, and ripen fruit without being inserted in soil of any kind, but simply in a liquid which contains eight different substances, namely, potash, lime, magnesia, iron, sulphuric acid, phosphoric acid, chlorine, and nitric acid, the nitric acid being capable of being replaced by ammonia or hippuric acid, uric acid, etc. It is furthermore stated that

neither the nitrogen compounds, iron, nor any other of these eight bodies can be omitted from the fluid in question if the plants are to pass through their various stages of development without becoming bleached or prematurely dwarfed. It is also shown by the experiments that while only these eight bodies are necessary elements of our culture-plants, others, found in ashes, such as silicic acid, manganese, copper, fluorine, and soda, are to be considered, if not essential, at any rate useful. Finally, the experiments appear to show that a plant is capable of deriving the whole of the carbon necessary for its growth, for the increase of its foliage, for the formation of sugar, starch, etc., from the atmospheric air, in the form of carbonic acid, by means of the stomata of its leaves. This novel method of prosecuting investigations upon the growth of plants and the formation of their tissues and components, it is believed, tends much toward securing exact results in such researches, and in time may enable us to acquire a thorough knowledge of the phenomena involved.—6 *C*, 1871, *June* 1, 216.

EXPERIMENTS ON THE GERMINATION OF SEEDS.

Mr. Vogel, of the Bavarian Academy of Sciences, has made a series of interesting experiments on the germination of seeds exposed to the action of different chemicals, either in a solid or a liquid condition. He found that many chemical combinations, though absolutely insoluble in distilled water, injured or destroyed the germs of seeds, and inferred that the process of germination itself produces vegetable acids which then act as solvents. He was actually able to determine, by sprouting barley, clover, and water-cress, the amount of said acids, which, though differing with different seeds, was always quite considerable. He experimented with Prussian blue, carbonate of magnesia, oxide and carbonate of copper, chromate of mercury, sulphur, and antimonial preparations, and, more recently, with aniline and amorphous phosphorus, and found that all these insoluble substances prevented germination, either entirely or to a great extent, while the presence of sublimed indigo had not the least effect. Of solutions, he mentions chromate of potash (nitrate of silver) and arsenious acid as especially injurious, and states that other mineral acids, when very much diluted, are less obnoxious. Remark-

able for the anomaly is the destructive influence of acetic acid, so harmless to the animal organism, which, even in very small quantity, prevented germination as completely as the poisonous oxalic acid; prussic acid, on the contrary, only retarded the development of the germ. Being volatile, it disappears from the solution, and a great proportion of the seeds germinated, while arsenic acid destroyed the germs entirely. Mr. Vogel also exposed his seeds to an atmosphere of coal gas, and found that, when thoroughly purified, its influence was not deleterious. Believing that the destructive action of the impure gas is due to the admixture of tar, he examined some of its constituents, and found naphthaline to be quite harmless to vegetation, while a minimum of carbolic acid was sufficient to kill every trace of germination.—*Sitz. ber. K. Bayer. Akad. der Wiss. München*, 1870, II., 3, 289.

RAISING FRUIT-TREES FROM THE SEED.

Mr. A. Czerny, of Austria, states, as the result of long-continued observations and experiments, that the strongest and best fruit-trees can be raised from seed, thus obviating a great deal of expense and disappointment to the pomologist. According to his observations, the extent and ramification of the roots of a healthy tree is to that of its crown in the ratio of three to two, so that the action of the roots is always preponderating. In this relation he finds the reason why fruit seeds from trees, budded or grafted upon indifferent stocks, have always been found unreliable, and he endeavors, as the first step, to obtain good trees grown upon their own stock, the seeds of which, he says, will reproduce their parents with certainty. To this end he layers a branch of a good tree, which, when well rooted, serves him as stock, into which he introduces buds or scions of such varieties as promise to improve the original fruit. By judicious cross fertilization he obtains fruit the seed of which will propagate, to a greater or less extent, the good qualities of the varieties used in hybridizing, and thus a new fruit is originated which, when suitable, can always be reproduced from its seed. Such trees, says Mr. Czerny, are more healthy and vigorous (having never been wounded by the knife), bear earlier, and, when accidentally injured in the stem, throw out shoots identical with those of the original tree.—8 *C*, 1871, 101.

REMOVING MOSS FROM TREES.

The removal of moss from fruit-trees, as well as their judicious pruning, is of great importance to their health, this growth being not only detrimental to the vigor of the tree, but also serving as a convenient hiding-place for injurious insects. Its eradication may be accomplished by first scraping off carefully and then covering the places where it grew with a thin paste of equal parts of plaster and potters' clay, in water. The moss will disappear and the bark of the tree become smooth and healthy. Dead and broken limbs, suckers, etc., should also be removed annually, and the head of the tree always kept open to air and light. Pruning is usually done late in the fall or winter; but many horticulturists now recommend the latter part of the summer as the fitting time.—9 *C*, 1871, *Feb.* 12.

PRIZE OF BEET-SUGAR ASSOCIATION.

The German Association for beet-root industry, at Berlin, has lately offered a prize of a thousand thalers for the solution of the following problem: The yield of crystallized white sugar from the different crude beet sugars is not in a direct ratio to their polarization. What investigations and calculations can be suggested in order to determine theoretically, beforehand, the yield, in refined white sugar, which any beet-root sugar will furnish.—14 *C.*, CCI., 279.

EARLY VEGETABLES.

According to *Nature*, Professor Decaisne has brought to the notice of the Academy of Sciences in Paris a scheme for the rapid growing of cabbages, radishes, etc., which are to be sown in richly-manured soil, and then used, stem, root, and all, as fresh vegetables. This diet is intended to protect the inhabitants of Paris against the scurvy, which may be expected to make its appearance in time in consequence of the necessity of using salted meats.—12 *A*, *Dec.* 15, 1870, 132.

SIMPLE MODE OF REARING MUSHROOMS.

An ingenious method of forcing the growth of mushrooms, so as to furnish a constant supply, has been devised by a Baron De Tincal. This gentleman places a number of little

boxes in his stable, about three feet long and ten inches wide, arranged on shelves like those of a book-case, before which a thick curtain slides in order to keep out the light. He sows the spawn of the mushroom in a bed of compost of horse-dung, or dead leaves and vegetable earth well manured, and he has in this way a crop of mushrooms all the year round. The horses in the stalls are said to be none the worse for this process, and no unhealthy emanations have ever been remarked in the stables.—2 *A*, *August* 6, 88.

RAISING APPLES AND PEARS IN DRY SEASONS.

An eminent pomologist in Brussels, De Johnghe, has succeeded in obtaining well-grown apples and pears in dry seasons by watering the trees from time to time, and by making holes in the ground underneath them and occasionally introducing some liquid, but not very highly concentrated, manure. This application is stated to be particularly important at the time when the fruit is setting.—9 *C*, VII., *July*, 53.

RUSSIAN METHOD OF PRESERVING FRUIT.

A method of preserving fruit, quite frequently adopted in Russia, consists in slacking fresh lime by sprinkling it with water and adding a little creosote. The fruit is to be packed in wooden boxes, with a layer of the prepared chalk powder of an inch in depth at the bottom. This layer is to be first covered with a sheet of paper, and upon it the fruit is to be laid so as not to touch each other. On the first layer of fruit another sheet of paper is placed, with the lime powder sprinkled over it, and a sheet of paper over this; upon this another layer of fruit is spread, as before, and the process continued until the box is full. The corners may then be filled with charcoal. If a tight-fitting cover is put on the box, the fruit, it is said, will maintain its freshness for at least a year.—10 *C*, *June*, 1870, 87.

CULTIVATION OF ASPARAGUS.

The culture of asparagus was lately the subject of discussion by the members of the Horticultural Society in Dessau, and among the views expressed were the following: That the old method of burying large quantities of manure deep under the surface was objectionable, since asparagus does not

derive its nourishment from a great depth, and the plants often become too deeply imbedded when the thick substratum of manure collapses by rotting. The preference often given to old plants, in making selections for a new bed, was also considered a mistake. Plants become sickly and less vigorous in the seed-bed, so as to be much more sensitive to the change in transplanting. Southern exposure, shelter from cold winds, a porous soil, and the total absence of trees, were recommended as essential conditions to the highest success. The soil is to be turned to the depth of from two to three feet, and then manured to the depth of one foot. This is most conveniently done in autumn, during dry weather. Spring is the best time for planting, and the best direction of the trenches for the reception of the plants is from north to south. The earth taken from the trenches is "walled up," as it is termed, between the rows, and upon these other vegetables may be cultivated while the asparagus bed is young, but they are eventually absorbed in filling up the ditch around and between the plants. Well-rotted manure, or suitable compost, is combined with the earth of the walls for this purpose. Besides giving constant attention to stirring the soil and weeding, the young plants need to be watered regularly whenever the state of the weather requires it.—10 *C*, 1871, 28.

PROPAGATION OF THE GRAPE BY EYES.

A German agricultural journal informs us that the grape-vine can be propagated by means of eyes, so as to save three years' time in the growth, each eye furnishing a new shoot. Each grape-vine will furnish as many shoots as it has sound eyes, and they are to be cut off about a quarter of an inch from the eye on each side, so as to leave a cylinder of wood about half an inch long, with the eye in the centre. If prepared in the autumn, these eyes may be put in a cellar in winter. In April they are to be laid down at a depth of two or three inches in furrows about six inches apart, and covered with a little manure, watered in dry weather, and the earth about them occasionally loosened.—9 *C*, *February*, 1870, 12.

REARING GRAPE-VINES IN POTS.

A horticulturist in Stuttgardt has devised an ingenious method of rearing grape-vines in pots so as to obtain grapes with very little trouble in a room or other sheltered place. For this purpose a vigorous, healthy cutting of the late growth of the wood is taken, from three to five feet in length, having at the upper end two fruit-buds. The cutting is to be entirely enveloped with moss, and bound with bast, but so as to leave the extremity bearing the fruit-buds uncovered. The cutting thus prepared is to be inserted spirally into a sufficiently large flower-pot, leaving the fruit-buds projecting above the edge of the pot, which is then to be filled with rich hot-bed earth well moistened, and placed in the sun behind a window and kept uniformly moist. The water applied should never be cold, but rather lukewarm, so as to stimulate to the utmost the development of the young roots. When the weather is such that there is no danger from night frosts, the pot may be placed outside the window or against a sunny wall, or even inserted in the ground in order to secure a more uniform moisture and temperature. When the two fruit-buds have produced branches, having bunches of grapes upon them, these shoots are to be trimmed so that two sound leaves remain over each grape-shoot, in order to keep up the circulation of the sap, since without this the grapes would not develop. A single leaf would be sufficient, but two are better, for greater security. An occasional watering with a liquid manure is advisable in order to stimulate the growth of the plant, although this must be applied with care, since an excess will do more harm than good. In one instance a grape-shoot treated in this way produced nine large bunches of fine grapes, although such a number would be rather more than could conveniently be supported by the plant.—8 *C, July* 28, 1870, 244.

CHINESE METHOD OF PRESERVING GRAPES.

Travelers inform us that the Chinese have a method of preserving grapes so as to have them at their command during the entire year, and a recent author gives us the following account of the method adopted. It consists in cutting a circular piece out of a ripe pumpkin or gourd, making an

aperture large enough to admit the hand. The interior is then completely cleaned out, the ripe grapes are placed inside, and the cover replaced and pressed in firmly. The pumpkins are then kept in a cool place, and the grapes will be found to retain their freshness for a very long time. We are told that a very careful selection must be made of the pumpkin, the common field pumpkin, however, being well adapted for the purpose in question.—8 *C*, 1871, *July* 28, 240.

TREMELLAT PROCESS FOR PRESERVING GRAPES.

A method for preserving grapes through the winter, introduced by M. Tremellat, of Marseilles, is commended in agricultural journals as answering its purpose better than many of the improved methods of the day. This depends upon the fact that, in the ordinary storage of grapes, a portion of the water, both of the stem and of the berry, is lost by evaporation, so that they dry up unless moisture is restored to them. To obviate this difficulty, the bunches are cut in such a manner as to leave a considerable portion of the adjacent woody part of the vine, and are then suspended over a vessel filled with water, so that while only hanging near the surface of the water the ends of the stems are immersed. As the moisture evaporates from the grapes it is restored by capillary absorption through the stem, and no change takes place. By means of the arrangement thus indicated, M. Tremellat has succeeded in keeping grapes from one year over into another, fresh and fair as in the moment of gathering, and his method is now used on a large scale in Paris and elsewhere.—13 *C*, 1871, 791.

THE JARDIN D'ESSAI IN ALGIERS.

The French government established many years ago in Algeria a "jardin d'essai," in which all plants likely to be easily grown in Algeria, and which might be useful either for their ornamentation or from their economic value, should be kept for distribution or for sale. The Société Générale Algérienne has now the control of these gardens, and, under the able management of its present president, M. Auguste Rivère, they have attained great interest and importance. An avenue was planted in 1847, which now consists of about eighty trees of the date-palm, from 20 to 50 feet high, and about one hundred

and fifty of the dragon's-blood tree (*Dracæna draco*), about 8 feet in height. All the trees were, in December last, in full flower or fruit. Among the more remarkable of the smaller avenues is one formed of bamboo (*Bambusa arundinacea*), planted in 1863, and forming an immense mass of foliage, the stems supporting which are from 40 to 50 feet high; and another formed of about one hundred plants of *Chamærops excelsa*, each being about 10 feet in height; other palms which flourish to perfection are *Caryota urens* and *C. Cumingii*, growing 15 feet high and covered with fruit; *Oreodoxa regia*, from Cuba; several plants upward of 25 feet in height, and a plant of *Juboa spectabilis* 12 feet high. There is a small forest of *Anona cherimoya* in full fruit, which is nearly as good as that of the closely related species which yields the custard-apple. Near this is an immense tree, some 30 feet in height, covered with fruit of the Avocado pear (*Persea gratissima*), and at its feet a quantity of guava-trees (*Pisidium cattleyanus*) crowded with its perfectly ripe, large, pear-shaped, golden fruit. In the New Holland district of the garden are different species of acacia, many of them 20 to 25 feet in height, and magnificent trees of several genera of Proteaceæ, *Banksia, Hokea*, and *Grevillea;* and trees of *Eucalyptus globulus* planted in 1862, and then only a few inches high, which are now about 40 feet in height, and over 4½ feet in circumference. There is a specimen of *Araucaria excelsa* about 60 feet high, and measuring a little over 9 feet in circumference at its base.

SUB-TROPICAL GARDENING IN ENGLAND.

One of the most successful attempts at sub-tropical gardening in England is on the estate of Mr. Robert Were Fox, F. R. S., at Penjerrich, near Falmouth, in Cornwall. The temperature is here extremely mild in winter, the thermometer never falling below the freezing-point for more than two or three nights in succession, and hardly ever below 30° F., and snow never lying on the ground. Many trees and shrubs which are only seen in hot-houses in other parts of England here grow to perfection out of doors. The hydrangeas, covered with magnificent masses of blue flowers, here form splendid banks by the side of a stream running through the grounds, the small lakes in which are covered with several exotic spe-

cies of water-lily, and the grass by the side carpeted with the selaginelle, which forms such a favorite bed for ferns in green-houses. There is a specimen of rhododendron 180 feet in circumference, and the camellias are every where loaded with fruit. The dragon's-blood-tree (*Dracæna draco*) grows well out of doors, as also does the Australian gum-tree (*Eucalyptus globulus*). There is a magnificent specimen of the camphor-tree (*Laurus camphora*), and several of the rare *Benthamia*. Several marmosets are allowed free liberty in the grounds, climbing to the tops of the highest trees, and always returning to the house at night. At a spot on Falmouth Harbor called Flushing, the temperature through the year is even still more equable, and the establishment of a tropical garden there would probably be attended with the most successful results.

SORBY ON TINTS OF FOLIAGE.

We have already referred to the investigations of Sorby in regard to the various tints of foliage, and especially to the change of color in the leaves in autumn; and in a late number of *Nature* we find a *résumé* by him, giving the present state of his inquiries on the subject. He separates the different coloring matters into five groups: first, the *chlorophyl* group, characterized by being insoluble in water, but soluble in alcohol and in bisulphide of carbon, and embracing three or four species; second, the *xanthophyl* group, containing several species, only two of which are common in leaves, one being more and the other less orange. They are characterized by being insoluble in water, and soluble in alcohol and in bisulphide of carbon, differing, however, from the members of the first-mentioned group in having peculiar spectra; third, the *erythrophyl* group, comprising a number of colors soluble in water, in alcohol, and in ether, but insoluble in bisulphide of carbon. Those met with in leaves are more or less purple, are made bluer by alkalies and redder by acids; and thus sometimes plants containing the same kind may vary more in tint, owing to a variation in the amount of free acid, than others colored by entirely different kinds. Among the species some have very interesting botanical relationships, being so far found only in particular classes of plants. Fourth, the *chrysotannic* group, containing a considerable number of

yellow colors, some so pale as to be nearly colorless, and others of a fine dark golden yellow. They are soluble in water, in alcohol, and in ether, but not in bisulphide of carbon. Of these there are two sub-groups, one in which a dark color is produced with ferric salts, constituting the tannic acid subgroup, and the other giving no such reaction, and forming the chrysophyl sub-group. In both sub-groups the intensity of color is usually greatly increased by partial oxidization, and they are thus altered into colors of the following group. Fifth, the *phaiophyl* group, which comprise a number of colors insoluble in bisulphide of carbon, and of very variable solubility in water or alcohol. These are in that state of oxidization which has a maximum intensity of color, and are simply decolorized by further oxidization. Our author proceeds to state that the numerous tints of foliage depend almost entirely on the relative and absolute amount of the various colors of these different groups, although all their relationships can not at present be explained.

The color of green leaves is mainly due to a mixture of chlorophyl and xanthophyl, and the variation in the relative and absolute amount of these easily accounts for the darker and brighter greens. The tints are also much modified by the presence of colors of the erythrophyl group, which, according to circumstances, may give rise to lighter or darker browns, approaching to black or to reds. Healthy unchanged leaves also contain various substances belonging to the chrysotannic group; but in many cases, when these belong to the more typical kinds of tannic acid, their color is so faint that they have little or no influence on the general appearance of the leaves.

On the approach of autumn, before the leaves have withered, the foliage of different plants presents an exceedingly variable mixture of chlorophyl, xanthophyl, and erythrophyl, with the different members of the chrysotannin group, and it is to the changes which occur in some or all of these substances that the very variable tints of autumn are due. The most striking of these depend on the alteration of the chlorophyl. So long as it remains green the production of the bright reds and yellows is impossible; but when it disappears, the yellow color of the xanthophyl is made apparent, and if much erythrophyl be present or contemporaneously

developed, its color, combined with this yellow, gives rise to scarlet or red. In many cases, however, the chlorophyl does not disappear, but is changed into the dark olive modification, easily prepared artificially by the action of acids on the more green shades; and when this is present, only dull and unattractive tints can be produced. We may thus easily understand why the special tints of early autumn are yellows and reds, or dull and dark greens. In these changes the various pale-yellow substances of the chrysotannin group remain comparatively unaltered, and even sometimes increase in quantity, but they soon pass into the much darker red-browns of the phaiophyl group, while the erythrophyl fades, and thus later in the autumn the most striking tints are the brighter or the duller browns, characteristic of the different kinds of plants or trees.

As far as we are able to judge from the various facts described above, we must look, according to Mr. Sorby, upon the more characteristic tints of the foliage of early spring as evidence of the not yet matured vital powers of the plant. In summer the deeper and clearer greens are evidence of full vigor and high vitality, which not only resist, but also actually overcome the powerful affinity of oxygen. Later in the season the vital powers are diminished, and partial changes occur; but the affinity of the oxygen of the atmosphere is nearly balanced by the weakened, though not destroyed vitality. At this stage the beautiful red and yellow tints are developed which produce so fine an effect in certain kinds of scenery. Then comes more complete death, when the affinity of oxygen acts without any opposition, and the various brown tints of later autumn make their appearance, due to changes which we can imitate in our experiments with dead compounds.—12 *A*, *August* 31, 342.

CLEARING BEAN OF INDIA.

Among other vegetable productions of India is a species of *Strychnos*, known there as the clearing nut, the dried seeds of which are used to a considerable extent for the purpose of clearing muddy water. For this purpose one of the nuts is usually rubbed hard for a short time round the inside of the earthen pot; the water afterward is poured into it and left to settle, the impurities soon subsiding, and the water being left

pure, clear, and wholesome. It is said the natives never drink well-water if they can get pond or river water, which they treat in the way indicated. These seeds have much the action of alum, but are believed to be less injurious, and are very easily obtained any where in India. The fruit, when green, is made into preserves and eaten; but when ripe, and given in powder, answers the purpose of an emetic, a dose being about half a tea-spoonful. According to Dr. Pereira, the peculiar property of these seeds depends on the presence of albumen and caseine, which act as purifying agents, like those employed for wine or beer. If the seeds be sliced and digested in water, a thick mucilaginous liquid is obtained, which, when boiled, yields a coagulum. A similar application is made elsewhere of other kinds of seeds. Thus the inhabitants of Cairo render the muddy water of the Nile quite clear by rubbing bitter almonds, prepared in a particular manner, on the inside of the earthen jar in which the water is kept. —14 *A*, *July*, 1871, 43.

CINCHONA IN JAMAICA.

In the monthly report of the Department of Agriculture for March and April of the present year we find a valuable paper upon the cultivation of the cinchona in Jamaica, by Dr. C. C. Parry, the botanist of the Department, who accompanied the San Domingo investigating committee, and in returning spent some time in Jamaica. As the general result of his inquiries in regard to the cultivation of this plant, and the possibility of introducing it into any portion of the United States, he states, first, that the peculiar conditions of soil and climate suitable for the growth of the best varieties of cinchona plants can not be found within the present limits of the United States, where no suitable elevations possessing an equable, moist, cool climate, free from frost, can be met with; second, that the island of San Domingo, located within the tropics, and traversed by extensive mountain ranges attaining elevations of over six thousand feet above the sea, presents a larger scope of country especially adapted to the growth of cinchonas than any other insular region in the western hemisphere; third, that the existence of successful cinchona plantations in Jamaica, within two days' sail from San Domingo, would afford the material for stocking new plantations in the latter island at

the least possible expense of time and labor.—*Monthly Rep. Dep. Agriculture, April*, 1871.

DISTRIBUTION OF SEA-GRASSES.

A valuable paper by Dr. Ascherson has recently appeared in Petermann's *Mittheilungen* upon the geographical distribution of what he calls the sea-grasses, or the phanerogamous sea-plants, as distinct from the sea-mosses, or algæ. From this essay we learn that on the Atlantic coast of the United States we have of this group only the *Zostera marina*, or the well-known eel-grass, which is found so abundantly in shallow bays and elsewhere, and which, while a great impediment to boating, serves as the harbor and home of our young fish and marine invertebrates. Some other genera and species occur on the western coast of North America, and others again in the West Indies.—17 *C, July*, 1871, 7.

FLOWERING OF PLANTS IN EUROPE AND AMERICA.

According to Carl Fritsch, the lines of simultaneous flowering of plants lie from five to ten degrees farther south in North America than in Europe, elevation above the sea level seeming to have comparatively little influence.—12 *A, April* 13, 1871, 479.

OLDEST HERBARIUM IN EUROPE.

Dr. Kessler claims to have discovered lately in Cassel the oldest herbarium known, some of the plants having been prepared in 1556. It contains 614 plants, properly fastened down and labeled, and was formed by Caspar Katzenberger.—1 *C*, I., 1871, 16.

EUCALYPTUS TREE.

Much success seems to have been experienced in the introduction of several species of *Eucalyptus* from Australia into various parts of Europe and California, and it is probable that in this plant we may have a very important addition to our material resources. Its great merit consists primarily in its adaptability to regions otherwise unsuitable for the growth of forest vegetation, in the extreme rapidity of its growth, and in the great value of the wood for economical purposes. When planted in marshy land, it has a very

decided effect in draining the soil, and freeing it from a malarious tendency, while it is said to thrive where the annual rain-fall is scarcely sufficient to keep ordinary trees in proper vigor.

In one case, a specimen raised in Algiers had attained, at the end of eight years, an elevation of nearly thirty-five feet, and a circumference of five feet at a distance of three feet from the ground. In Australia it reaches enormous dimensions, equaling, if not exceeding in height, though not in circumference, the far-famed giant trees of California.

As is well-known, trees having this rapid growth are generally soft and spongy, and of comparatively little value for timber; but the *Eucalyptus* is quite the reverse, the wood being very heavy and hard, resisting the action of air and water, as well as of most kinds of insects. In general properties it resembles the wood of the oak, and it is employed very largely for ship-timber in Australia. The growing plants disseminate an aromatic fragrance, which is supposed to be conducive to health. This is due to the volatile essential oil, which can be readily collected, and is known as *eucalyptol.* The leaves furnish two and one half per cent. of their weight of this substance, which has come into use already as a solvent of resins, and even of caoutchouc; and it is warmly recommended for the manufacture of varnish. It is also valuable as a febrifuge; and on this account, in Spain and the south of France, it has been made to replace quinine with decided advantage.—*Bull. Soc. d'Encouragement, etc., Paris,* XVII., 342.

HYDRATED LIME ON WATER-PLANTS.

Bauer found small crystals on confervæ in a fresh-water pond, which, on farther examination, he discovered to consist of a hydrate of the carbonate of lime, containing five molecules of water, precisely similar to those first discovered by Pelouze in a solution of lime in sugar, and subsequently detected in a well-tube. This hydrate is distinguished by the peculiarity of losing its water at a temperature higher than 59° F., even when under water.

I. AGRICULTURE AND RURAL ECONOMY.

SULPHURIC ACID FOR DESTROYING WEEDS IN LAWNS.

A writer in an English journal suggests the use of ordinary sulphuric acid, or oil of vitriol, as an excellent agent for the destruction of weeds on lawns. The difficulty of eradicating such unsightly elements of the lawn is well understood, since to do so satisfactorily requires the removal of a large amount of dirt, producing a corresponding injury to the general appearance. By taking the acid in question, and allowing a few drops to fall into the crown of any obnoxious weeds, it will turn them brown in an instant, and ultimately cause the death of the plant. Great care must of course be taken to prevent any of the acid from falling upon the skin or any article of clothing; but, with ordinary care, a large amount of surface can be treated in a short time with most excellent results.—2 *A*, *May* 14, 1870, 352.

ECONOMY OF LONG FURROWS IN PLOWING.

A German agricultural journal observes that farmers usually pay very little attention to the length of the furrows to be plowed in a field, and yet great waste of time and labor is the necessary consequence of unsuitable arrangements in this respect. The turning of the plow and the commencing of a new furrow requires more exertion in the plowman and the team than continued work on a straight line; and how great may really be the loss of time from frequent interruptions in short turns may be shown by the following calculation. In a field 225 feet long, five and a half hours out of ten are used in redirecting the plow; with a length of 575 feet, four hours are sufficient for the purpose; and when the plow can proceed without interruption for 800 feet, only one and a half hours of the daily working time are consumed. Hence the rule to make the furrows as long as circumstances will admit.—10 *C*, *May*, 52.

CHARLIER HORSE-SHOE.

A new horse-shoe introduced in Paris by M. Charlier has been favorably received. It consists of a narrow rim of iron, thoroughly protecting the edge of the hoof without cramping its sole in the least. The material to be used must be of the best quality, but the weight being considerably less, the cost is not increased. Thousands of horses of the many public conveyances in Paris have been provided with these shoes, and they give general satisfaction.—10 *C, May*, 58.

DRAINING WITH FASCINES.

The choking up of clay drain-pipes, especially when used to carry water containing iron in solution (from which the oxide of iron is precipitated), has frequently caused great difficulty in keeping up a proper drainage; and, in view of this fact, the propriety of adopting the old method of using fascines, or bundles of wicker-work, has been urgently recommended. For this purpose, a coarse wicker-work, made of alder or willow, is to be loosely plaited together into a tube of about ten inches in diameter, braced by cross-pieces at intervals of two feet. A number of these are to be united into a continuous tube, and laid in the ditches prepared for their reception. Sod is then to be laid on the top, with the grass-side down, and the trench filled with earth. In this way a very cheap system of drainage is obtained, which will remain for a long time without filling up, while earthen-ware tubes do not answer their purpose for more than six or eight years. The use of the wicker-work has the additional advantage of allowing the air to penetrate upward through the soil, thereby increasing its productive properties.—2 *A, February* 1, 1871, 24.

INJURY OF GREAT BATTLES TO VEGETATION.

A remarkable feature attendant upon the late French-German war is said to have consisted in the destruction of vegetation in the vicinity of the great battle-fields, this being not simply the result of mechanical injuries, but of some more potent agency, and, according to one writer, the result of the enormous mass of powder burned during the battles. As soon as the powder is exploded sulphuric acid is distributed

through the atmosphere, and driven forward by the winds until it is carried by rains down into the soil, where it destroys vegetation, the effect being quite similar to that of the same gases as thrown out of manufacturing establishments. As, during the war, many thousand tons of powder were burned, it would be quite easy to understand that an immense number of cubic feet of sulphuric acid must have been thrown off into the atmosphere.—10 *C*, *August* 1, 104.

SEASON FOR CUTTING TIMBER.

According to Dr. Hartig, March and April are the most favorable months for cutting timber intended to be used by builders and carpenters, the average per cent. of moisture being less than forty-seven, while in the three following months the average is forty-eight, and in the three winter months fifty-one. He states that properly-seasoned timber contains from twenty to twenty-five per cent. of water, and never less than about ten per cent.; and if the moisture is entirely removed by artificial means, the wood loses its elasticity and flexibility, and becomes brittle. Any artificial seasoning of wood should be carried on very gradually, the temperature at the beginning being low, and the process not conducted too far.—8 *A*, *January*, 1871, 12.

SEASONING OF WOOD.

A writer in an English journal informs us that small pieces of non-resinous wood can be seasoned perfectly by boiling four or five hours, the process taking the sap out of the wood, which shrinks nearly one tenth in the operation. The same writer states that trees felled in full leaf, in June or July, and allowed to lie until every leaf has fallen, will then be dry, as the leaves will not drop of themselves until they have drawn up and exhausted all the sap of the tree. The time required is from a month to six weeks, according to the dryness or wetness of the weather. The floor of a mill laid with poplar so treated, and cut up and put in place in less than a month after the leaves fell, has never shown the slightest shrinkage.—18 *A*, *February* 3, 471.

PRESERVATION OF BEET-LEAVES FOR FODDER.

It is well known that in France the beet is cultivated on a large scale mainly for the preparation of beet sugar, and that the leaves are used very largely as food for cattle. A difficulty has hitherto existed in reference to this latter application, on account of the readiness with which the leaves become decomposed, and the impossibility of keeping them fresh for any considerable length of time. We are now informed that this has been overcome by M. Mehay, who subjects the leaves to the action of dilute hydrochloric acid, by means of which, after undergoing a special treatment, they can be stacked away in large quantities and kept indefinitely for future use. The application of the acid employed, so far from injuring these leaves as food, seems to impart to them special alimentary peculiarities, seen in the production of an improved quality of butter. Several veterinary surgeons have certified, as the result of a critical examination of the experiments, that the food gave rise to no disturbance of the digestive system, and that in every respect the new preparation was to be considered a success.—3 *B*, *August* 8, 1870, 705.

ADULTERATION OF CLOVER-SEED.

A confidential circular from an enterprising German in Hamburg has lately come to light containing an offer to sell several tons of sand suitable for mixture with clover-seed, the grains of which resemble the seed so closely that it is almost impossible to distinguish them by the eye. The writer of this circular announces that this sand is in great demand, especially in England, for purposes of adulteration. Two colors are supplied, one for red clover and one for white.—10 *C*, *June* 1, 70.

VALUE OF THE SUNFLOWER PLANT.

Attention is called by the editor of the *Journal of Applied Science* to the great value of the sunflower plant in various economical applications. According to this article, the sunflower can be cultivated very readily, an acre of land sustaining 25,000 plants at twelve inches distance from each other. The flowers are very attractive to bees and furnish a great

amount of honey. The average production of seeds may be estimated at fifty bushels to the acre, yielding fifty gallons of oil. This is said to be equal to olive-oil for table use, and is well adapted to burning in lamps, soap-making, and painting. The refuse of the above quantity of seed will produce 1500 pounds of oil-cake, and the stalks may be either burnt to furnish potash, or, when treated like flax, may be made to yield a fibre as soft as silk, and in large quantity.—17 *A*, 1871, *June* 1, 83.

USES OF THE GROUND-NUT.

The rapidly increasing production of the ground or pea nut (*Arachis hypogæa*) is adding an important feature to the agricultural resources of the United States, which appears to be especially adapted to its cultivation. In addition to the uses to which it is applied by us, it is said that a large proportion of the so-called olive-oil in the market, and used especially in the arts, is obtained from the ground-nut. In China the same oil is used both for food and for purposes of illumination, the refuse cake remaining after the abstraction of the oil furnishing a good manure.—19 *A*, *February* 18, 123.

FAILURE OF THE ATTEMPT TO RAISE MADDER IN ENGLAND.

The commercial value of madder, so extensively used in dyeing, has of course led to its cultivation on a large scale in various parts of the world, and we find in a late number of the *Chemical News* the details of some experiments of this nature made in England. The results, however, are stated to have been quite unsatisfactory, since, although the roots were about equal in size to fine French roots, on breaking them they proved to be orange or yellow instead of a deep red color. The dyeing properties were also very disappointing, as the colors looked full out of the dye, but on being cleared with soap they were found to be loose and to resemble Dutch madder, the reds and pinks being weak and loose, and the purple element entirely wanting. Although this experiment was not decisive, yet Mr. Sidebotham, who had conducted it, is inclined to think that madder of a good color can not be grown in England.—1 *A*, 1871, *March* 24, 136.

RAMIE IN CALIFORNIA.

California, which is apt to take the lead in matters of industrial and agricultural import, is now interested in extending the cultivation of the ramie, all the roots of the plant that could be procured having been bought up by a company, and planted, to the number of a quarter of a million, on a farm in Alameda County. The principal desideratum is a machine for properly dressing the fibre; and it will be remembered that the India government offered a large prize for the best arrangement for this purpose. No award has, however, yet been made, the period of competition having been extended an additional year. It is said that the machine of Le Franc is used in Louisiana with entire success, 500 pounds per day being prepared from the green stalk at a very small expense.—*Cal. Sci. Press, March* 25.

ANALYSIS OF THE ASH OF THE POTATO.

A careful analysis has been made by Dr. Schoras of the ash resulting from the burning of potatoes, this amounting to from three to four per cent. of the dried potato. According to this chemist, the proportion of potash amounts to over fifty per cent., forty-five per cent. being the smallest quantity observed. Of soda there is generally from two to three per cent., in most cases only one per cent. being appreciable. Next to the potash, magnesia enters as the principal constituent among the bases, nevertheless amounting to only the tenth part of the proportion of potash. Lime is a subordinate element, in most cases scarcely equaling half the amount of magnesia. The percentage of potash was found to increase or diminish as the yield of the crop was greater or less, but of the other bases little difference was found in this respect. It was also observed that the percentage of phosphoric acid increased as that of potash diminished, so that in the abundant harvests it is proportionally less than in the scanty ones, varying from ten to nearly eighteen per cent. The proportion of sulphuric acid is tolerably constant, varying from five to six per cent. The percentage of chlorine varied very much, namely, from two to nearly eight per cent. The quantitative difference in the percentage of chlorine in the ashes was found throughout to have a direct relationship to the

amount of the crop itself. Should this inference, which the author now presents as provisional only, be substantiated by the further experiments he proposes to make, it may be considered that the combinations of chlorine have the same significance in the cultivation of the potato that gypsum has to various other cultivated plants. — 22 *C*, *November*, 1870, 293.

FEEDING POTATOES TO HORSES.

In Germany, where potatoes are so much cheaper than grain, the experiment has been repeatedly tried of feeding horses upon them, at least in part, and this, as we understand, has proved quite successful. In one instance five four-horse teams were kept hard at work and in good condition on a daily ration, for the twenty horses, of $1\frac{1}{2}$ cwt. of hay, 8 bushels of potatoes, 50 pounds of meal, and a liberal allowance of chopped straw. The potatoes were steamed, mashed, and mixed with the meal while hot, and then covered up and allowed to remain for a time, during which they undergo a slight fermentation and evolve a quantity of carbonic acid. The chopped straw was worked in just before feeding. This trial was continued for more than four months, and found to agree with the horses, while at the same time it proved satisfactory in point of economy. As this food must be sweet and clean, great care is necessary to prevent the vessels in which it is kept from becoming sour.—9 *C*, 1871, 19.

UTILIZATION OF SURPLUS POTATOES.

In cases where the potato crop is so large as not to be readily marketable, and more or less in danger of decaying through the winter, the surplus can be so treated as to furnish a valuable article of food, capable of preservation for a long time. For this purpose the potatoes are to be washed clean, steamed, peeled while still hot, and finally pressed through a fine sieve. The potatoes thus compressed are then to be laid, while still hot, upon gratings, and dried as quickly as possible, say in ten or twelve hours, in order to avoid any souring or putrefaction, this being generally the result of drying too slowly or with an insufficient heat. The potatoes dried in this way are of an excellent flavor, and can be packed and kept for years in a dry place, and are serviceable for pro-

visioning ships, armies in the field, etc. About 1000 pounds of fresh potatoes will make 100 pounds of the dry article, which, when properly prepared, will have precisely the flavor and appearance of freshly-boiled potatoes.—6 *C, August* 31, 247.

GIANT MARMONT POTATO.

A potato known as the Giant Marmont is much praised by late German writers as occupying the very first rank among potatoes, in consequence of various excellent peculiarities. A single tuber was said to have produced a weight of twenty pounds.—10 *C, January* 14, 11.

NEW VARIETIES OF POTATOES IN GERMANY.

German agriculturists speak quite favorably of some of the new varieties of potatoes recently brought to their notice. Dr. Rauch says of the early rose potato that, among a thousand varieties, none can be found like it. It is the earliest, as well as the most prolific of all early potatoes, ripening within six weeks, and keeping well until the following spring, and even improving in taste by being thus kept. It is pronounced excellent for table use, very valuable for stock-feeding, and the richest in starch for manufacturing purposes. The bovinia, or stock-feeding potato, is of gigantic size and astonishing in its yield. Its quality is also quite satisfactory to the housekeeper. The new ash-leaved kidney potato—ashtop fluke—is a very fine table variety, quite early, keeps well, and has very few and shallow eyes. It is highly recommended as a garden vegetable.—9 *C*, 1871, 17.

SPECIFIC GRAVITY TEST FOR POTATOES.

It is generally understood that the value of potatoes depends upon their specific gravity, and that the heavier the potato the greater the amount of nitrogenous matter it contains. This has suggested the idea of a convenient test by which the excellence of different varieties can be readily determined, and which consists in the use of saline solutions of different degrees of strength. If, assuming one variety as a standard, we make a solution of such strength that the potato will float at about the middle of the mass, neither falling to the bottom nor rising to the surface, and apply the same

test to other potatoes, we may conclude that if one fall to the bottom it is better, or if it rise to the top it is poorer, than the standard. A series of standards has been suggested, therefore, by Dr. Neslee, of definite percentages of salt and water, thus producing a sliding-scale applicable under any circumstances for the test in question.—8 *C, July* 13, 221.

REPORT ON THE POTATO DISEASE.

The Prussian Agricultural Academy has been occupied since 1863 in making laborious investigations into the mode of propagation and possible prevention of the potato disease. A report of operations has recently been published, from which it appears that the following points, among others, may be considered as finally determined: First. A relationship and connection between the disease of the leaf and of the tuber, and the fact that the potato-fungus is the cause of the wet-rot of the potato. Second. The wintering of the mycelium of the fungus in the diseased tubers is considered well established and as needing no farther verification. The mode of dissemination of the disease, however, is considered as requiring additional investigation, including the development of the mycelium of the infected tubers in the superficial portion of the young plant, as well as the formation of the leaf fungus. The inquiry is suggested also whether the first traces of the leaf disease in the summer come from the mycelium of the infected seed-potatoes of the previous year. Experiments are also proposed for ascertaining whether, if the young plants are completely protected from the entrance of fungus-spores from the exterior, a diseased mother bulb would produce diseased plants. The effort to find some convenient mode of disinfection of seed potatoes for the purpose of preventing the disease has not, so far, met with any satisfactory result. It is possible, of course, to destroy the mycelium of the fungus in the tuber by various means, but this generally injures the bud at the same time and prevents its growth.

One very important feature accomplished by these inquiries is the ascertaining that different varieties of potatoes vary extremely in their susceptibility to disease, some kinds being much easier of infection than others. It is suggested that the collateral inquiry be carried out for the determination of

the best varieties of potatoes which enjoy a greater or less immunity from attack. What it is, in the plant or tuber, that causes this condition is not yet ascertained, and it is thought that possibly, when the cause is known, the more sensitive varieties may be so modified as to have an equal advantage. According to some, the difference consists in the degree of smoothness of the external skin of the potato, while others maintain that it depends upon the thickness of the skin.—19 *C*, 1871, *July* 15, 222.

MANURE FROM DEAD ANIMALS.

Dead animals are utilized in France by immersing their soft parts in a very feeble solution of hydrochloric acid, which soon transforms them into an odorless pulp. This is to be mixed with phosphate of lime, and the result is a manure of the best quality.—9 *C*, *February*, 1870, 14.

UTILIZING FISH OFFAL.

An ingenious method proposed for utilizing the residue and offal of fish consists in first boiling it together with one tenth of its weight of cheap oil, heating it up from 250° to 300° Fahrenheit. It is then treated with sulphide of carbon, whereby the oil naturally contained in the fish, as well as that which was added, is extracted, and a mass is left, quite dry, and containing from five to six per cent. of nitrogen, and from twelve to fifteen per cent. of phosphate of lime.—1 *A*, *April* 29, 1870, 202.

ACTION OF POTASH ON FRUIT-TREES.

Dr. George B. Wood, in a communication to the American Philosophical Society in Philadelphia, presented the result of certain experiments made by him upon the effect of salts of potassa when applied to grain and fruit-producing soils. In his view, the depreciation of the productiveness of apple, peach, and quince orchards is due to the exhaustion of potash from the soil. Several of such orchards, formerly very valuable, but which had within a few years ceased to bear much fruit, on being treated with an application of wood ashes to the roots of the tree, became completely revived, producing full crops the following year. A still more striking effect was seen the second year, under a renewal of the application.

He cited several other instances where the same results followed; in one case where an apple orchard, planted on an old orchard's site, which had never borne fruit, was made to produce a good crop by the application of ashes.—*Pr. American Philosophical Society.*

EFFECT OF MANURE ON PLANTS.

A communication, illustrated by diagrams, was presented to the Horticultural Society of London in reference to the effect of manures upon plants in the experimental grounds at Chiswick. As a general rule, plants in unmanured boxes were less vigorous than in those manured; and while purely mineral manures had little effect upon the grasses, they produced a marked improvement in the case of the clovers. Experiments with solutions of ammonia salts and with nitrate of soda showed specific differences in the results in the case of almost all the different species of plants, and it was found that a plant affected favorably by one of these groups of salts was influenced in quite the opposite manner by the other.—5 *A*, 1870, 78.

APPLICATION OF POTASH TO PLANTS.

Professor Nobbe, of Tharand, has published the result of certain experiments made by him upon potash as a nutrient of plants, the method adopted being one to which we have already referred, and known as the "water culture." The plants experimented upon were buckwheat and rye, although the conclusions arrived at had reference more particularly to the former. The solutions used were divided into those in which the potash was completely excluded, or in certain cases replaced by bodies of similar chemical properties, and into those in which potash is present, but in different chemical combinations. The general conclusions reached were that, in solutions free from potash, otherwise nutrient, the plants vegetated as if in pure water. They were unable to assimilate, and exhibited no increase in weight, for the reason that without the co-operation of the potash in the chlorophyl grains no starch was developed. The chloride of potassium was found to be the most effective form of combination under which the potash could be offered to the buckwheat plants; next to this came the nitrate of potash. With sulphate or

phosphate of potash, a disease was developed sooner or later, which, starting with a positive heaping up of the starch, ended in preventing the starch from being taken into the chlorophyl grains, and rendered useful in vegetation. Soda and lithia were found incapable of replacing potash in a physiological point of view; furthermore, while soda was found to be perfectly useless to the plant, lithia, when introduced, proved to be positively destructive to the vegetable tissues. —19 *C*, *August* 5, 245.

SPEEDY GROWTH OF RADISHES.

In the publications of the Acclimatization Society of Palermo we are informed that radishes may be obtained at any season, and very quickly, in the following manner. The seeds are to be first soaked for twenty-four hours, and then placed in bags and exposed to the sun. They will begin to germinate in about twenty-four hours, and are then to be set in a box filled with well-manured earth, and moistened from time to time with lukewarm water. In five or six days the radishes will attain the size of a small onion. To grow radishes in winter, the box is to be placed in a warm cellar, covered with a top, and the earth moistened from day to day with lukewarm water.—9 *C*, *July*, 53.

CHINESE USE OF ARSENIC IN AGRICULTURE.

Arsenic is said to be used in China for the purpose of preserving the young and tender roots of plants from the attacks of field-mice and other vermin, which application is said, in addition, to exercise a favorable influence upon the growth of the plant and its yield of fruit.—3 *A*, *August* 5, 93.

EFFECT OF VARIOUS MANURES ON THE GROWTH OF GRASS.

Experiments have been recently instituted by the Agricultural College at Worms, Bavaria, for the purpose of ascertaining the relative effect of several different manures upon the growth of grass. In presenting an account of the results obtained, we may state, for the more satisfactory understanding of the subject, that the "morgen" amounts to nearly three fifths of an acre. Muck increased the yield of hay, per morgen, by 7 cwt., but deteriorated the quality of the grass. But this is believed to have resulted from the use of muck not sufficient-

ly seasoned by exposure to atmospheric action. Human excrement gave an increase of $13\frac{3}{4}$ cwt. per morgen, while the growth was very thick even in the poorest places. The cows, however, refused to eat the grass, although they appeared to have no objection to the hay. It was believed that the grass of the following season would be palatable to them. Liquid manure from stable drains and sinks had a powerful effect, and increased the crop of hay by $14\frac{1}{2}$ cwt. per morgen. The grass was good, but the flowering herbs disappeared. Two cwt. of bone-dust, fermented in a compost of earth and liquid manure, increased the yield of hay, per morgen, 12 cwt., and developed an abundance of white and red clover, and its influence, it was thought, would extend through several seasons. But the best effect as to the quality, though not the quantity of grass, was obtained by the application of potash salts. The grass was fine and tender, and almost free from the coarse herbs, with an increased yield of $11\frac{1}{2}$ cwt. per morgen.—10 *C*, 1871, 27.

SAND COMPOST.

A German agricultural paper recommends the application of a kind of sand compost upon mossy meadows as highly successful. Sand, or sandy soil, is piled up and daily watered with the liquid of stable drains or sinks. To prevent the escape of ammonia a sprinkling of gypsum is applied. This compost is to be worked over, and after four or five weeks it is fit for use. The writer claims that the heavy sand smothers the moss, while the fertilizers promote the growth of grass, and he refers to his favorable results as proof.—9 *C*, 1871, 29.

MANURE FROM INDIAN CORN.

It is said that a new manure is prepared in France from Indian corn, a substance now largely used in French distilleries. The grain, previously coarsely broken, is first subjected to the action of dilute sulphuric acid, to convert its starch into sugar. After fermentation the refuse is placed in large tanks, and when all the solid matters have subsided the clear liquid is drawn off, and the residue yields an excellent manure, containing about 9 per cent. of water, 68 per cent. of organic matters, including nearly 5 per cent. of nitrogen,

and about 19 per cent. of mineral matter.—13 *A*, *May* 14, 1870, 208.

SOURCE OF MINERAL PHOSPHATES.

The source of phosphatic manures, such as are found in the mineral form in various deposits, is a subject that has attracted much attention on the part of chemists and agriculturists. Of course, as regards guano, the phosphoric acid is readily referable to the excrement and offal of sea-fowl. Certain guano, such as Sombrerite, is derived from the action of water on this matter, and the subjacent calcareous coral rocks. It is thought that much of the palæozoic phosphatic rocks may have been produced in this way; at any rate, those which have been formed subsequent to the evolution of terrestrial and vertebrate animals. There are, however, many beds the origin of which can not be referred to any of the causes just mentioned. Professor Dyer, in an article on this subject in *Nature*, suggests the same view that was presented at the late meeting of the American Association by Professor Kerr, namely, that the brachiopods may have supplied a large percentage, the recent *Lingula*, as is well known, having over eighty per cent. of phosphate of lime in the mineral ingredient of its shell. In fact, he is of the opinion that the large quantities of phosphate of lime in the Laurentian and Silurian, as well as in the Devonian and carboniferous strata, are derived from this source. In the mesozoic and tertiary strata, instead of finding the mineral phosphate in veins and beds, it occurs mostly in the form of nodules. Mr. Dyer coincides with the hypothesis previously presented by Mr. Lankester, based upon the property possessed by clay of detaching phosphate of lime from its solution in carbonated water. The nodules in question are believed to be bits of clay, which have been imbedded with great quantities of bones, as perhaps, also, with sea-weed, from which, by the intervention of gas-charged water, they have extracted the phosphate. Hence the almost invariable occurrence of beds of phosphatic nodules near argillaceous strata.

This same view has been used to explain the origin of the phosphatic nodule beds which have lately been detected in immense extent in the vicinity of the city of Charleston, forming a mineral fertilizer which is coming into very ex-

tended use. Among other applications, this substance is ground up and mixed with prepared fish, and converted into an excellent manure for worn-out lands.—12 *A, November* 24, 1870, 62.

SULPHATE OF MAGNESIA AS A MANURE.

The accumulation of sulphate of magnesia, or Epsom salts, as a waste product at a mineral-water establishment in Königsberg, where it is offered for sale at about fifteen cents per hundred weight, has suggested its use for agricultural purposes, as its constituents enter largely into the composition of most vegetable substances. Magnesia, especially, is found in considerable quantity in the seeds of various cultivated plants, and especially in corn, etc. The experiment has already been tried of applying the sulphate of magnesia to one part of the field, and the sulphate of lime, or gypsum, to the other; and, according to Professor Goltz, it is stated that in the case of clover especially, the difference was very marked in favor of the magnesia, although the general nature of its agency appears to be quite similar to that of the gypsum. Both seem particularly valuable in this connection, on account of entering directly into the composition of the plant instead of requiring a certain transformation before being taken up. The sulphate of magnesia, as stated by Professor Goltz, has a perhaps still more important application in the stable, acting like gypsum in retarding the decomposition of the manure, and fixing the ammonia developed from it. The sulphate of magnesia, however, acts more quickly and energetically than gypsum, in consequence of being very soluble in water; quite the contrary being the case with gypsum. From the preceding considerations, therefore, it is inferred that sulphate of magnesia is quite equal to gypsum as a fertilizer, and decidedly superior for use in stables. From one pound to one and a half pounds per day, per head, will suffice for the latter object, or from four to five hundred weight per annum. The cost in the vicinity of Königsberg, being less than one half that of gypsum, is an important point in favor of the Epsom salt.—9 *C, September*, 67.

VOELCKER ON SOILS.

Mr. Voelcker, an eminent agricultural chemist, delivered a lecture before the Chemical Society of London upon the productive power of soils in relation to the loss of plant-food by drainage, in which he took occasion to refer to the inutility, for most purposes, of the analysis of soils, as ordinarily conducted. He states that there are many apparently similar soils—that is, soils in which analysis shows like quantities of the same constituents—which differ widely in their productive powers, owing to the fact that the indications are of ultimate composition instead of showing states of combination in which the ingredients exist in the soil.

Another consideration of importance is that soil analyses throw no light upon the physical or mechanical conditions which affect the fertility of land. The productiveness of land is much influenced, too, by the character of the subsoil and its composition in relation to the surface-soil, of which a soil analysis conveys no information. Again, meteorological conditions, such as the aspect of the field, the prevailing wind, the amount of rain, and the distribution of the rain-fall in the year, are all of the utmost importance in farming, and are, of course, not indicated by any analysis.

Dr. Voelcker, however, would not be considered as regarding such analyses as of no value, since in many cases quite the contrary is the fact. For instance, it is easy to determine whether a soil is deficient in lime or not, and thus ascertain whether it is proper to impart a dressing of this mineral. It is also known that potash salts may be applied with great advantage on some soils, while on others their fertilizing effects are scarcely perceptible; and the determination of the question whether there be enough potash in the soil will enable us to decide upon the proper action in this respect.

Again, it is possible to ascertain, by finding whether there is potash in clay, as to its being benefited by burning; burnt clay being an excellent fertilizer if the clay contains undecomposed silicates of potash; but the expense of this process would be entirely wasted if the clay be naturally poor in alkaline silicates. Again, peaty soils are often completely barren, this condition being due, in most cases, to the presence

of sulphate of iron and finely divided iron pyrites, so small an amount as $\frac{1}{4}$ per cent. of the former being quite sufficient to render a soil entirely unproductive.

We can also ascertain by analysis whether a soil contains an excessive portion of one or more matters otherwise useful to vegetation, such as nitrate of potash, chloride of sodium, etc. It appears to be the fact that all soils which contain readily soluble salts, in quantities admitting of precise determination, are more or less unproductive, although the salt may be a very effective fertilizer when applied in a weaker solution. Thus a soil containing $\frac{1}{10}$ per cent., or even less, of common salt hardly grows any crop; this being the case with land inundated by the sea. Such a proportion, indeed, of any substance is much greater than could at any time be applied with safety, while very minute quantities are frequently of the utmost efficiency; for so small a quantity as fifty pounds of nitrate of soda, applied to an acre of grass-land, or to wheat or barley, and thoroughly washed into the soil, will produce a most marked effect in the darker green color and greater luxuriance of the herbage compared with the portion not so treated. One hundred pounds of ammonia applied to an acre of land, in the shape of sulphate or of chloride of ammonium, has been known to raise the average produce of wheat twenty bushels, with a corresponding increase of wheat straw; and three hundred pounds of superphosphate of lime, of good quality, has been found to increase the turnip crop in favorable seasons from six to ten tons per acre.

If a man wishes to make a living by farming, Dr. Voelcker thinks that at least from three to five times as much of all the more important fertilizers must be put annually upon the land as is removed from it in the crops, a depreciation in the crop resulting when a materially less amount is applied.—21 *A*, *London*, *June*, 1871, 276.

"ALLIOS" OF THE PLAINS OF SOUTHERN FRANCE.

It is known to some of our readers that certain sandy soils in the south of France, formerly perfectly barren and blown about by the winds, have been reclaimed, by planting with pines and firs, so as to become of much economical importance. A curious alteration has, however, taken place in the

soil, in the formation, at a depth of about three feet, of a stony layer, of a brown color and of a moderate thickness, called, locally, *allios*, and covering a bed of indefinite depth of sand similar to that above it. The presence of organic matter in this allios seems to prove that it has been derived, in a measure at least, from the surface vegetation of the land. In winter and at the commencement of spring the level surface of the land is constantly covered, to a greater or less extent, with rain-water. The action of the sun during the warm portion of the year reduces this by evaporation to a depth of one or two yards in relation to the general level of the swamps and marshes bordering the interior of the chain of downs. A decomposition of the plants of the surface soil, by reason of their long immersion in the stagnant rain-water, takes place, and the products are carried by this filtering across the upper layer, to the average depth of about one yard. In doing this they appear to cement together, to a certain degree, the sand at this level; and as the operation has been renewed every year for a long period, a layer of allios, more or less compact, is formed, which doubtless will continue to increase. One unfortunate result of this impermeable subsoil is the development of intermittent fever, which appears to prevail in this region; and the only way to avoid it is to produce a drainage by digging ditches, and by sinking pits in the allios to the depth of about one yard, and breaking holes in its crust, through which the water runs off very rapidly, leaving the surface perfectly dry. To prevent the terrible conflagrations which would be likely to take place among these forests should they be kept as dry as proposed, it is suggested that it will be necessary to divide them up into sections by lines of surface free from vegetation, across which any forest fire would not be transmitted.—3 *B*, *August* 4, 632.

SILK-WORM REARING IN CALIFORNIA.

Parties in California have for some years found it to their interest to engage in the production and exportation of silkworms' eggs, for the purpose of supplying Italy and France with healthy worms, as, until quite recently at least, the worms hatched from Californian and Japanese eggs were less liable to the many diseases that had rendered the cultivation

of native eggs in Europe so uncertain. It seems, however, that, owing to the interruption of the silk-worm industry caused by the war, there is little demand for these eggs, and that dealers have a large stock on hand, for which, at present, they find no market. There is said to be a similar surplus in Japan, for the same reason. The California papers are therefore urging upon the citizens of the state to undertake the rearing of the worms themselves, and the production of silk.—*Scientific Press, California, March* 25, 188.

DESTROYING ANTS.

A French agriculturist reports that, after trying every method known to him for the destruction of ants infesting some of his fruit-trees, he succeeded in effecting his purpose in the most complete manner by placing a mixture of arsenic and sweetened water in a saucer at the foot of the trees. For the larger species he made use of honey instead of sugar, and he found that in a few days' time he could exterminate them completely.—8 *C*, *Sept.* 22, 1870, 304.

DESTROYING THE LARVÆ OF THE COCK-CHAFER.

It is said that the destructive larvæ of the cock-chafer, which, both in this country and in Europe, does so much damage to pastures by devouring the roots of grass and causing the death of the sod, may be exterminated by applying to the places affected water in which petroleum has been stirred. The same treatment is also recommended in other instances where it is desirable to keep down the ravages of insects on plants. Applied in this way there is no danger of injuring the plant, and a small quantity of petroleum appears to impart its antagonistic qualities to a considerable amount of water.—9 *C*, *June*, 1870, 45.

DESTRUCTION OF GRAIN BY INSECTS.

Some idea of the injury caused by insects to agricultural products may be formed from the statement that, from 74 tons of Spanish wheat stored in a granary, 10 cwt. of beetles were screened out in one instance, and in another 35 cwt. were removed from 145 tons of American corn. The offender in both cases was a weevil known as *Colandra oryzæ*.—15 *A*, *April* 9, 1870, 488.

KILLING RABBITS BY SULPHUR.

It is well known that the European rabbit has been introduced into Australia, and by its enormously rapid multiplication bids fair to become a veritable pest to the country. Many remedies have been proposed for their extermination, among which the burning of sulphur in their burrows has been strongly recommended. An article by a Mr. Archer, on this subject, however, recounts the numerous experiments made for the purpose of their destruction by sulphur, and ends with the statement that this method is not at all satisfactory, and that carbonic acid would probably be more efficient.—12 *A, March* 2, 359.

PROTECTING GRAIN-FIELDS FROM CROWS.

An effective method of preventing the devastation, by crows, of fields that have been recently planted with grain, is said to consist in stretching cords, longitudinally and transversely, upon stakes, about a foot above the earth, and about ten paces apart.—8 *C*, 1871, XXIV., 190.

FOOD OF HENS.

The kind and quality of food given to fowls must necessarily exercise an influence upon the quality of their eggs and flesh, although usually little attention is paid to the matter. A gentleman who kept a large poultry-yard found occasionally that the eggs of his hens had an unpleasant and rancid taste, and on inquiry ascertained that this was always the case when the food consisted of hemp or flax seed.—8 *C*, 1871, XVI., 137.

COMPARATIVE FECUNDITY OF DUCKS AND HENS.

Some interesting experiments have been made upon the comparative fecundity of ducks and hens so as to determine from which of the two the larger number of eggs can be obtained in the same time. For this purpose three hens and three ducks were selected, all hatched in February, and nourished with suitable food. In the following autumn the ducks laid 225 eggs, while the hens laid none. In the next February the laying season began again with the ducks and continued uninterruptedly till August. They showed no incli-

nation to set, but became very thin, although they afterward fattened up somewhat. The total number of eggs laid by the hens amounted to 257, or 86 eggs each; and 392, or 131 each for the ducks. Although the eggs of the ducks were rather smaller than those of the hens, yet they proved to be decidedly superior in nutritive material, so that the superiority in productiveness appears to be decidedly with the ducks.—13 *C, August* 11, 1870, 1140.

COOLING OF BROODED EGGS.

An inquiry is made of the German Poultry Journal whether eggs brooded upon and allowed to become cold can be hatched; in reply to which it is stated that, from extensive observation, it has been shown that eggs which have remained cold for two days or more may even then be successfully brooded, and that the nearer to the period of the escape of the young, the longer may this cooling last. It is, however, necessary that at least half of the brooding period be passed, as, if eggs are left too long in the first half of the period, especially if this is repeated many times, the embryo will, in almost every instance, die. In the second half of the period the chick is already so far formed that a prolonged cooling is not especially injurious to it. It is also established that eggs thus cooled require a longer time than usual to come to maturity.—8 *C, February* 2, 40.

STIMULATING HENS TO LAY WHILE MOULTING.

According to a good authority in poultry-raising, it is considered inexpedient to encourage hens to lay while moulting. When new feathers are forming the ovary usually remains perfectly dormant, and, in fact, sometimes becomes greatly reduced in size. When, however, the feathers are renewed, if a hen be judiciously fed, and in good health, the production of eggs will soon recommence.—2 *A, December* 24, 1870, 464.

FEEDING NETTLES TO LAYING HENS.

The Vienna Agricultural and Forest Journal states that hens fed in the winter with chopped and boiled nettle-leaves, or with the seeds, and kept in a warm place, will continue to lay during the entire winter. The experiment was first sug-

gested by noticing the eagerness with which both domestic and wild fowl devour the nettle-leaves and seeds whenever the opportunity is afforded. This proclivity is believed to be the reason why, with the enormous yield of seeds on the part of the nettle, comparatively so few plants spring. It is stated also that in Denmark the seeds and leaves of the nettle are fed very carefully to horses, after having been collected, dried, and ground: three times a week, morning and evening, a handful of this nettle-dust is mixed with the oats, in consequence of which the horses are said to become fleshy and sleek, and their hair to grow unusually long, and to assume a remarkably beautiful, silky lustre. — 8 *C*, *January*, 1871, 3.

FEEDING UNBROKEN GRAIN TO HOGS.

Dr. Lehmann has lately communicated to the Agricultural Association of Saxony the results of some experiments of feeding unbroken grain to hogs, the animal to which the test was applied being a three-year old pig, of an English breed, which had previously been fed, for a year and three quarters, exclusively with rye bran. Four pounds of bran were given to it every twenty-four hours, and on each of the first two days of the experiment an addition was made of one pound of the grains experimented upon, the rations being furnished in only a slightly moist condition. The first of the undigested grains were passed off at the lapse of from twenty-four to twenty-five hours, the last of them appearing at various intervals, as at the end of sixty-two hours for oats, seventy-two hours for barley, seventy-eight hours for rye, and the same for peas. In reference to the quantity of undigested and unaltered grains found in the excrement, it is stated that in one hundred pounds there appeared unchanged and entire 50.6 of oats, 54.8 of barley, 49.8 of rye, and 49.4 of peas. From these results it will be seen that in general only half of the entire grain is used in the process of digestion, and that every one who furnishes food in this manner has to supply twice as much as is actually necessary, at, of course, double the necessary cost. It is therefore very evident that a due regard to economy makes it expedient to reduce the food to a more or less fine condition before it is given to such animals.—8 *C*, *January*, 1871.

GRINDING FODDER FOR DOMESTIC ANIMALS.

The practice of grinding or crushing hay and straw instead of the usual method of chopping it, as an article of food for domestic animals, is coming very much into favor. The digestibility of these substances, as is well known, is much increased by steaming and softening with water, but a very marked improvement in the condition of cattle, it is said, is speedily observed in consequence of the adoption of the process referred to. It is maintained, also, that horses fed with ground hay are much less liable to suffer from attacks of colic than when the food is chopped, and that an appreciably smaller quantity will supply sufficient nutriment, less passing off in the form of undigested fibre. The operation of grinding is effected by means of millstones, or any other conveniently-adapted arrangement, a very soft article of food being produced, which is extremely acceptable to the cattle.—22 *C*, *November*, 1870, 297.

IMPROVEMENT OF THE BREED OF CATTLE.

According to Professor Schmied, a permanent improvement of the breed of cattle is inseparably connected with the following proposition, namely, that calves must be nourished with a sufficient quantity of their mother's milk for a much longer period than has hitherto been the custom, all other methods having reference to this same object being insufficient without a proper adherence to this fundamental consideration.—22 *C*, *November*, 1870, 297.

CATTLE INJURED BY EATING GREEN FLAX.

Observations in Prussia have shown that the eating of green flax by cattle may be seriously injurious. A well-kept cow suddenly became ill, with high fever and violent diarrhœa, accompanied by trembling of the muscles, anxious look, drying up of the milk, and a lowering of the temperature at the extremities. On inquiry into the cause of this sudden attack, it was found that the animal had eaten a great quantity of the weedings from a flax field. Strict diet, without any medicine, improved her condition during the day, but the next morning, epileptic convulsions ensuing, her owner

had her killed, when, on examination, solid masses of the flax were found within the stomach.—9 *C*, 1871, III., 17.

CONSTITUENTS OF THE MILK OF DIFFERENT ANIMALS.

From an examination of different kinds of milk with reference to their solid constituents, it has been ascertained that asses' milk is most diluted, containing scarcely 9 per cent. of solid matter. Next comes human milk, with somewhat over 11 per cent., while mares' milk contains 17 per cent. The average is seen in the milk of the goat and of the cow. In reference to the percentage of casein and albumen, human milk is poorest, containing only 4 per cent. of casein; cows' milk nearly 5 per cent., with more than one half per cent. of albumen. Again, goats' milk, with nearly 6 per cent. of casein and albumen, as far as known, has a larger amount of albumen than that of any other mammal. The smallest quantity of butter is found in asses' milk; that of the goat containing the largest, or nearly 7 per cent. Sheeps' milk is most nutritious, as it contains $11\frac{1}{4}$ per cent. of protein matters and hydrocarbons; and while the milk of the cow contains only about 4 per cent. of milk sugar, that of the mare has 8 per cent., which renders it very prone to alcoholic fermentation, and has given rise to its employment by the Tartars in the production of an intoxicating liquor known as quass.—17 *A*, *September*, 131.

THEORY OF FATTENING ANIMALS.

An important suggestion has been made by Mr. Lawes, of England, on the waste of food during respiration, and its relationship to the fattening of animals. He remarks that in the case of animals fed for the butcher, the economy of the feeding process will be the greater, the less the amount of food expended by respiration, in the production of a given amount of increase; and it is equally obvious that one ready and efficient means of lessening the proportion of waste or expenditure to the increase of the products is to lessen, as far as possible, the time taken to produce it. In other words, to fatten as quickly as possible. Thus, from experiments made by him, he assures us that a pig weighing 100 pounds will, if supplied with as much barley meal as he can eat, consume 500 pounds of it, and double his weight—that is, increase

from 100 pounds to 200 pounds—in seventeen weeks. He then points out that if, instead of allowing the pig to have as much barley meal as he will eat, the 500 pounds of meal had been made to last many more weeks, the result would have been that the animal would have appropriated a correspondingly larger proportion of the food for the purposes of respiration and perspiration, and a correspondingly less proportion in the production of increase. In other words, if the 500 pounds of barley meal were distributed over a longer period of time, it would give less increase in live weight, and a larger proportion of it would be employed in the mere maintenance of the life of the animal. Indeed, if the period of consumption of the 500 pounds of meal be sufficiently extended, the result will be that no increase whatever will be produced, and that the whole of the food, excepting the portion obtained as manure, will be expended in sustaining the animal's existence.—16 *A*, *July*, 1870, 377.

EFFECT OF THE FOOD OF COWS ON THE COMPOSITION OF THE MILK.

A series of experiments prosecuted not long since in Germany led to the conclusion that, contrary to the usual impression on the subject, very considerable changes in the composition of food may be made without inducing corresponding changes in the relative constituents of the milk of the cow, the only effect being in the amount of the concentration of the milk. To determine these results with accuracy, Dr. Kuhn has repeated the experiments, with the general result of showing that an increase in the albumen and fatty elements of a moderate diet produces an increase in the milky yield, which gradually rises (along with bodily condition) to a certain maximum, corresponding in each case with the maximum increase of the above elements. Sooner or later, however, the natural diminution depending on the duration of lactation occurs, and no increase can be produced by increasing the food. Diminution of the above elements of the food causes a diminution in the milk yield. The addition of fat increases the ingredients of milk generally, and has no special influence on the amount of fat in the milk. The absolute production of the individual elements of the milk agrees generally with the relative production of the

milk as a whole (most regularly in the case of sugar). The variations from this are different for the different ingredients.

In the percentage numbers, sugar does not seem to be affected by the diet. The variations in the amount of albumen are so small as not to be capable of determination. No influence on the amount of casein could be traced to the food. The influence of food on the amount of fat is seen to be very small. When it appeared to be altered it was after increase of the albuminoids of the food. Increase of the fatty elements of the food did not specially affect the amount of butter; the variations in the percentage amount of casein and fat are to be attributed to irregularities in the fat production in the gland. The farmer must therefore not hope, by variations in the food, to produce a "butter-cow" or a "cheese-cow." The differences in this respect are differences of stock and individuals.—21 *A*, *June*, 1871, 424.

USE OF WATER-GLASS IN WASHING WOOL.

Among the many practical applications of water-glass, or the silicate of potash and soda, its use in the washing of wool is said to be not the least important. For this purpose one part of the water-glass is to be dissolved in forty of warm water, and the wool placed in it for a minute, and stirred around a little with the hand. It is then to be taken out and rinsed in cold or lukewarm water, when it will be white and entirely free from smell. After this treatment the wool is said to remain perfectly soft, and is not affected in the slightest degree, even if allowed to remain for several days in the solution, and then rinsed out with warm water. Wool may be washed very rapidly in this way, and in large quantity, by inclosing it in baskets or nets, immersing it in the solution, and treating it as above mentioned. Even the sheep can be rendered of snowy whiteness very quickly if immersed for a minute in a vessel containing the above solution at a temperature of 100° to 120°, and then rinsed in pure water. In this case it may be necessary to take some precaution to prevent the introduction of the solution into the eye of the sheep, which may be done by fastening the legs securely to prevent struggling, and, perhaps, enveloping the head for the time in a cloth.

A similar use of the water-glass is recommended for the

ordinary washing of clothes, the process consisting in laying the fabrics in a solution of one part of glass and twenty to thirty of water at a temperature of 100° to 150° Fahrenheit, and allowing them to stand several hours, when they are to be stirred around with a stick, the bath having been previously heated up by the addition of warm water. The clothes are then laid upon a board or over bars to drain, when the liquid coming from them will be found to contain nearly all the dirt. After this, treatment in the ordinary way, with a very little soap, will quickly remove any remaining impurity. It is recommended to place the clothes a second time in a weak solution of water-glass—one part in fifty—and finally to rinse out with warm water. Clothes thus treated, it is said, become of a dazzling white, and do not need bleaching.—9 *C*, *May*, v., 33.

CARBOLIC ACID AND RINDERPEST.

Dr. Hope, in a communication to the British Association, stated the result of certain experiments upon cattle with carbolic acid during the rinderpest pestilence in 1867. Of about 270 cows under his charge the majority were attacked by the disease, but by injecting a solution of carbolic acid, either through the mouth or rectum, he was enabled to recover 111 of them. The remainder, not so dealt with, died or had to be slaughtered. For this reason, he argued that the chemical treatment of contagion is much better than the medicinal, both in respect to man and adult animals.—8 *A*, *October*, 1870, 181.

LA PLATA OR CARNO GUANO.

The residuum of the flesh used in the establishments of Buenos Ayres for the purpose of preparing Liebig's extract of meat is now to be met with in commerce under the name of La Plata or Carno guano, and is recommended very highly as a manure. Analysis shows that this contains nine parts in one hundred of water, forty-one of organic matter, nineteen of lime, magnesia, oxide of iron, etc., ten of phosphoric acid, from one half to one part of potash, and the rest of insoluble matter, such as sand, clay, etc. The nitrogen amounts to nearly six per cent.—6 *C*, *August* 10, XXXII., 318.

PROPER SEASON FOR FELLING TREES.

It is said that if trees felled in summer are immediately stripped of their bark, the timber thus obtained will be in no way inferior to that from trees which are cut down in winter.

PREPARATION OF PEAT.

Mr. Alloway has lately delivered a lecture upon peat, before the Society of Arts of London, in which he points out the difficulties that have hitherto prevented the utilization of this substance as a fuel. He adverts to the expensive apparatus used by various persons for treating it, and especially for condensing the peat by pressure, and states that it is impossible to do this satisfactorily by the ordinary means, owing to the peculiar spongy structure of peat and the difficulty of drying it. His method consists in first breaking up the freshly-cut clods with a mallet, by which they are disintegrated, after which they are to be placed in a ditch in the peat-bog filled with water, where they are to remain, forming a thick mush, until the time comes for further treatment. Early in April the operation of making into bricks is commenced, and a small quantity is taken up at a time and moulded rapidly by hand into pats, which are then laid upon slats and allowed to drain and dry, this being generally accomplished in the course of a few days.—3 *B*, *September* 14, 525.

HUMATE OF AMMONIA.

It has already been observed that plants grown on soil rich in silica and poor in humus contain less silica in their ash than those grown on soil poor in silica but rich in humus. Since an excess of silica is always present in soil, the amount taken up by a plant must clearly depend on other circumstances than the quantity at its disposal. Thénard has recently thrown light on the subject by showing that humic acid forms, with ammonia and silica, very permanent acid compounds. These compounds are soluble in very dilute alkali, from which solution they can be separated unchanged. They lose nitrogen only at a high temperature. Humic acid does not combine with silica unless ammonia be present. It appears probable from these considerations that humic acid

plays an important part in the economy of plant-growth. When seeds germinate on wet blotting-paper, a brown zone, having the reactions of humus, forms at some distance from the seed. The author concludes that humus is produced in this case from a soluble colorless body by the action of the atmosphere.—21 *A*, *August*, 1871, 748.

NITROUS AND NITRIC ACIDS IN SOILS.

Investigations have lately been prosecuted by Chabrier upon the presence and functions of nitrous acids in soils. The soils examined were finely powdered and passed through a sieve, and then bleached, according to the method adopted in the saltpetre works of Algiers, for the purpose of determining the percentage of nitrous and nitric acids. As the result, it was ascertained that all tilled soils contained nitrous acid. Nitric acid, as is well known, is accumulated, especially in dry weather, in the superficial strata of the earth, the reverse being the case with the nitrous acid. Hence it would seem that the soluble nitrates ascend in the soil by capillarity in dry weather, when they are transformed, at least in part, into nitrates, which, on the other hand, are washed out by the rain. The water of the soil generally contains 1 part of nitrous acid to 25,000 parts of water; never more than 1 part in 5000. Fields which have lain fallow contain little nitrous acid but much nitric acid; while, on the other hand, forest land contains moderate quantities of nitrous and but little nitric acid; and inundated clay no nitrous and but little nitric acid. The author is of the opinion that the nitric acid, in spite of its slight percentage, is of importance in the earlier periods of vegetation.

DISPOSAL OF THE NITROGEN OF MANURE.

From more than twenty years of experiment, Laws and Gilbert have ascertained that harvest plants do not by any means take up all the nitrogen which has been put into the soil in the form of manure, or of ammonia, or other concentrated substances. Even if land be manured with the same amount of nitrogenous matters, and the same plants be cultivated, not half of the nitrogen is abstracted from the manure. Of the remainder, a certain part is to be met with in the form of ammonia in the drainage water, and a considerably larger

amount occurs therein as nitric acid, a large part of the nitrogen being abstracted from the manure in this way. Of what is left, however, a very considerable portion is accumulated in the soil, and is carried into its deeper strata.

LEACHED ASHES AS A MANURE.

An agricultural journal of Germany calls renewed attention to the great value, as a manure, of soap-boilers' leached ashes, which, as is well known, are prepared by mixing wood-ashes with fresh-burnt lime, and boiling or leaching the two together for the purpose of obtaining a caustic lye. Although the soluble salts are removed from these ashes, the insoluble parts remain, namely, the carbonates, sulphates, and phosphates, principally lime salts, accompanied generally by a little caustic lime. Experience has shown that there is no substance equal to leached ashes of this kind for manure, not excepting even the richest guanos; the vegetation of the cereals becoming broader than common by its use, and the stalks more tubular, while the leaves grow of a dark bluish green. The value of this application is seen more particularly in meadows, where, curiously enough, nearly all the ordinary grass disappears in consequence, and instead of it a thick vegetation of red clover is met with, which will be renewed year by year for a long time, without additional supply.—*C* 1, III., 48.

GUANO IN THE ARGENTINE REPUBLIC.

A Buenos Ayres journal congratulates the people of the Argentine Republic upon the discovery of guano in great quantity on certain sea islands belonging to that country, an entire cargo having lately arrived at the city. The discoverer reports that the amount is very large, and dreams of rivalry with Peru in the possession of this valuable commodity are already freely indulged by the Argentines.—*Panama Star and Herald.*

FISH-GUANO FLOUR FROM LOFFODEN.

A Norwegian company offers for sale a fish guano from the Loffoden Islands, prepared from the heads and backbones of the codfish, collected during the great winter fisheries off the Norwegian coast, principally by children and old and infirm persons who have no other means of subsistence. Formerly

this matter was thrown into the sea as refuse, and materially affected the permanence and efficiency of the fisheries; but it is now carefully collected and hung in bundles on the rocks to dry. In June and July it is brought to the mills, where it is cut into pieces, dried artificially, and then ground between mill-stones. This article, prepared quite differently from the fish guano of the United States, is put up in bags, and finds a constant demand at about $45 a ton. It contains a great variety of ingredients fitting it for an excellent manure. The same company furnish what they call fish flour, which is made from the best dried codfish by grinding them up, bones, skin, and all, to the fineness of sawdust or flour, in which form it is largely used in Scandinavia for various kinds of cookery. It is sometimes mixed with potatoes or other substances, and sometimes formed into cakes or biscuit. The fish is more readily packed and transported in this form than any other, and it is said to keep a long time without deterioration. We would commend this last preparation to the attention of our people, as furnishing a hint toward a new article of trade in this country, and one that could be conveniently employed in cookery in a great variety of ways.—*Circular of Norwegian Fish-Guano Company.*

PREPARATION OF BUTTER.

It is quite a common belief that butter can only be made from sour milk, and chemists explain this on the ground that acidity is necessary to destroy the membrane which envelops the butter molecules, so that they are set free to combine with each other after shaking. Mr. E. H. Baumhauer thinks he has disproved this theory by the following experiment: He first carried fresh milk to his laboratory without shaking or exposing it; this he divided in four portions of half a gallon each, placing them in bottles of one gallon capacity. One he left neutral, viz., as it came from the cow; one was acidulated with lactic acid; one made slightly alkaline with carbonate of potash (this became acid during the manipulation); and the fourth received a greater quantity of carbonate of potash, and remained alkaline throughout. The temperature was about 70° Fahrenheit. These bottles were shaken violently for one minute by four men. When at rest wart-like grains adhered to the glass, which, under the microscope, looked

like drops of fat of oval but irregular shape, somewhat like mulberries. From minute to minute the shaking was interrupted; the globules uniformly increased, and after eighteen minutes yellow butter was obtained in all the bottles, in little masses like peas. According to our author, the lactic acid could have had no influence in dissolving the membranes of the globules, and, in fact, he doubts the existence of such membranes. He thinks that shaking at the proper temperature combines the floating particles of butter; when the milk is too cold, no butter forms; when too warm, a kind of emulsion is obtained, which, at a low temperature, hardens, but is white and less translucent than good yellow butter. Mr. Baumhauer promises the best success in butter-making whenever proper attention is given to the temperature of the milk, which ought to be between the narrow limits of 65° to 70° Fahrenheit.

METAMORPHOSIS OF ALBUMINOUS SUBSTANCES IN THE BODIES OF ANIMALS.

In the investigations upon the metamorphosis of albuminous substances in the bodies of ruminants by Stohmann, Frühling, and Rost, it has been shown, First, that the whole of the albuminoids undergoing decomposition in the organism appear in the form of oxidation products in the solid and liquid excretions. These results were obtained with food not only poor, but also rich in nitrogen. Second, the metamorphosis of albumen is dependent on the quantity of albumen in circulation in the organism. As a rule, the metamorphosis of albumen rises and falls with the albumen in the food. The increase of albuminous matters above a certain quantity is a waste with adult animals. Third, the imbibition of large quantities of water increases the metamorphosis of nitrogenous matters. Fourth, the excretion of nitrogen quickly adapts itself to an increase of nitrogen in the food. Fifth, with an insufficiency of albumen in the food the body becomes poorer in albumen. A goat which daily consumed in its food 8.27 grams of nitrogen excreted 11.1. The 2.53 grams lost daily correspond to 74 grams of flesh. The weight of the animal sank, in the ten days of the experiment, from 31.54 to 29.72 kilograms. Sixth, considerable increase of weight took place when, along with a sufficiency of albumen,

larger quantities of non-nitrogenous substances were administered.

These experiments showed that the metamorphosis of nitrogenous nutritive materials takes place in the herbivora exactly according to the same law as Voit established for the carnivora; and that relative to the metamorphosis of albuminous matters there is no distinction between carnivorous and herbivorous animals, save that the nitrogenous products of decomposition assume a different form, so that in the herbivora a portion of the nitrogen takes the form of hippuric acid, a substance which is wanting in the carnivora.—21 *A*, *August*, 1871, 728.

PROPER KIND OF WATER FOR WASHING WOOL.

Professor Trommer, of the Agricultural Academy in Eldena, in reference to the importance of the quality and chemical composition of the water used for washing the wool of sheep, whether before or after shearing, calls attention to the fact that the matter to be removed by washing is quite complex, and consists, in the main, of the non-volatile portion of the sweat, the grease of the wool, abrasions of the epidermis, the dust from the surroundings, and the dirt from the excretions of the animal. It has an alkaline reaction from the prevalence of potassium, either in the form of carbonate, or in its combination with grease as a kind of soap. Pure water readily dissolves these potash compounds, and the resulting solution is in itself a very good wash; but when the water contains lime, a decomposition takes place, and insoluble compounds of lime (either carbonate or soap of lime) precipitate upon the wool and are removed with the greatest difficulty. Hence the necessity of avoiding calcareous water. Professor Trommer mentions an easy way to detect the presence of lime, viz., a solution of soap in alcohol, when poured into a tumbler of water, will make it rapidly turbid whenever it contains salts of lime, while pure water remains clear for some time. When, however, necessity compels us to the use of hard water, the addition of some alkali is recommended, which shall precipitate the lime in solution as an insoluble carbonate. Caustic soda is the cheapest for that purpose. The author enumerates some of the advantages arising from the washing of the wool after being shorn, remarking that

the quantity of water necessary for the operation being so much less, its qualities can be corrected much more easily and with less expense, and its temperature made exactly suitable. Above all, the health of the animal will not be endangered, as is done by the old proceeding. The professor calculates that in the average six thousand and forty units of heat are consumed in the evaporation of the adhering water, which he thinks too heavy a tax on the animal economy.

CHANGE OF MATERIAL IN ADULT SHEEP.

Henneberg and others have been lately conducting a series of experiments upon the change of material in the adult sheep, under uniform feeding, the animals being two four to five year old wethers. These were fed with as much meadow-hay as was needed to keep them in good condition in regard to nourishment, while each had ninety grains of common salt daily, and as much water as they wished. The experiments were conducted with the assistance of Pettenkofer's respiration apparatus. It was found that the excretion of carbonic acid by the animals during the daytime was different from that during the night, but that this was determined, not by the amount of light and darkness, but by the distribution of food during the two portions of the twenty-four hours. The feeding was generally followed very soon by the excretion of carbonic acid. The excretion of water by the skin followed much the same rules as that of the carbonic-acid excretion. A parallelism was found between the excretion of the carbonic acid and of the water in twenty-four hours, both being greater or less as the consumption of nutriment or respiration material was greater or less. From this it would appear that, to economize food, it is necessary to protect animals from conditions which induce perspiration.

A certain medium temperature of the stall in which the animal is fed will be the most economical, since, while the lesser heat involves the necessity of a greater amount of food, an increased temperature, on the other hand, produces an increased consumption of water, and, in consequence, the increased transudation of water through the skin of the animal produces a loss of heat of the body by conduction and radiation.

The result showed that the food consumed was slightly

greater than that required to keep the body in *statu quo* along with a normal growth of wool, but not to an extent which had any real significance. The atmosphere contributed only one sixth part to the material received, but, on the other hand, laid claim to nearly one half of the material excreted. More than one half of the organic substance of the food fell, directly or indirectly, to the process of respiration, while the growth of new wool absorbed not one per cent. of it. About eight ninths of the residue were found in the fæces, and one ninth in the urine.

The oxygen excreted in the form of carbonic acid was nearly equal to that removed from the atmosphere, which is a general characteristic of herbivorous animals. The distribution of various mineral constituents of food, on their reappearance in the fæces and urine, corresponds on the whole, though not exactly, with their respective solubilities and dyalitic relations. The two alkaline earths, lime and magnesia, appeared in relatively large proportions in the fæces—the lime in greater proportion than the magnesia. Similarly with the two alkalies and the urine, the potash was recovered therefrom in greater proportion than the soda. Of the phosphoric acid scarcely more than a trace was found in the urine.—21 *A*, *August*, 1871, 729.

ACCLIMATION OF THE ANGORA GOAT IN AUSTRALIA.

A strong desire to have Angora goats more generally introduced and acclimated in Australia has lately been excited in that country by the appearance at an exhibition in Sydney of a flock of these valuable animals accompanied by their kids. These goats are hardy and prolific, while their hair, being used, in combination with silk, for the manufacture of the most costly fabrics, commands a high price. Owing to the ease with which they can be kept, the rearing of Angora goats would seem likely to render quite profitable the vast area of poor land in Australia.—7 *C*, 1871, 187.

MARITIME EXPOSITION AT NAPLES.

A maritime exposition has lately taken place at Naples, which was well attended by delegates from different nations, and many subjects of general importance were considered during the session. The principal topics discussed were,

first, those relating to international maritime law; second, international commerce; third, mercantile marine; and, fourth, fisheries, international and along shore. Under the latter head the following topics were suggested for present and farther consideration:

1. Can the sea, or certain sections of its shore, positively lose in regard to the number of its diverse inhabitants on account of particular methods of fishing? What are the proofs of any asserted diminution? and might these signify any other result than real numerical diminution? If there be actual diminution, what measures should be taken—local, general, or international—to prevent such injury, and, on the contrary, to increase the production of marine creatures?

2. How can a series of observations be organized which will tend to establish the fecundity of one or more species of fish, the number of individuals which reach maturity, and the laws of individual growth, together with the seasons and localities most opportune for fishing?

3. How can there be instituted in the Mediterranean, in addition to the ordinary hydrographic researches, investigations in regard to the temperature, the saline saturation of the water, the flora and fauna of its different beds, and the character of the bottom at all depths, from the profoundest to the shallowest, following its coasts and its depending basins and bays?

4. Is it necessary to provide for deep-sea fishing by an international code?—*Boston Daily Advertiser.*

STEAM IN HERRING FISHERIES.

In view of the great waste of labor and the concomitant expense in the present mode of conducting the herring and other great fisheries of England, by means of row or sail boats, the experiment has lately been tried, with a very satisfactory result, of tending the nets by means of small steamboats; and it is likely that before long all the establishments of this kind, of any magnitude, will be provided with auxiliary steam-power. These boats are generally about thirty-seven feet long and nine broad, being well timbered and strong, and capable of standing a heavy sea. They carry five days' provisions, and will steam at the rate of nine miles an hour. The cost of working, including the salary of the men

and boys, fuel, depreciation of value, etc., is given at about three dollars per day. One single firm has supplied about 120 of these boats within the last three years. They are, however, not considered serviceable in trawling, as the varying success does not admit of a sufficiently large profit for the payment of the excess of expenditure in the way of engines and fuel. —19 *A*, *August* 5, 1871, 109.

REPORT OF THE CONNECTICUT FISH COMMISSIONERS.

The report of the Fish Commissioners of the State of Connecticut recently presented to the General Assembly is a document of much importance in the history of pisciculture, and embodies the results of the investigations and experiences for the past year. The history of what has been done in regard to the raising of black bass, shad, and salmon contains many important announcements, especially in reference to the increase of shad since the first experiments of artificial planting in the Connecticut River. In 1867 about 40,000,000 shad were hatched under the direction of Mr. Seth Green, and placed in the river a short distance below Holyoke dam, and their return as mature fish was awaited with great anxiety. About 60,000,000 were introduced into the same river in 1868; but nothing was done in 1869, in order to see whether the first experiments were successful. In 1870, corresponding to three years' growth of the young shad of 1867, these fish appeared in numbers greater than had been known for twenty years, vessels sailing through Long Island Sound observing immense shoals of them swimming through the water, all making toward Connecticut River. In one day over 28,000 shad of good size were taken about Saybrook, and corresponding numbers elsewhere. Although it is not absolutely certain that these shad were the same with those introduced in 1867, yet there is every reason to entertain such a belief—this being corroborated by the fact that up to the date of the report (May 18) the fisheries of 1871 were even better than in 1870, many thousands being taken at a single haul, and the markets being glutted to such an extent that the finest shad could be bought at from ten to twenty-five cents per pair.

Experiments are also detailed in regard to the introduction of the so-called land-locked salmon of the St. Croix River, as

well as of the true salmon; and although fisheries of these species have not yet been established, this result is confidently expected in the course of a year or two. The report concludes by a lengthened statement of the present condition of the fish-pound question in the state, and commendation is expressed of the existing act of the Assembly, by which all fishing by means of fixed nets is to cease after the end of 1871. A compromise, by which the pounds were to be kept closed from Saturday night to Monday morning, was found to be entirely inoperative, the fishermen refusing to accede to the requirements of the law, leaving no alternative, in the opinion of the commissioners, but the prohibition above mentioned.—*Fifth Report.*

NUTRITION OF YOUNG FISH IN HATCHING ESTABLISHMENTS.

Dr. Hartmann has lately made a communication to the German Fishery Society in regard to the age at which artificially hatched fish, salmon especially, should be turned out, and where; and he endeavors to show that very unscientific views have prevailed on this subject, which have resulted in serious loss to the stock. In his opinion about 30 per cent. of the eggs laid by the salmon are not impregnated at all, in consequence of not receiving a sufficient quantity of the milt of the male, and that 10 per cent. of the lay is destroyed by the male fish, leaving 60 per cent. of the whole. As these, however, are exposed to the ravages of small fish, crustaceans, birds, etc., as well as to the dangers from freezing, half are probably destroyed, leaving only 30 per cent. out of the original number (say 25,000) to keep up the supply. Supposing all these, however, to be hatched, we have then other dangers of equal moment. Thus those remaining have for a number of weeks the yolk-bag attached, and are easily injured by the currents or the sand at the bottom, and are greedily devoured by all sorts of aquatic animals; so that our author thinks it is well if, especially in the case of salmon and trout, half a dozen are left alive by the time they are able to swim about and take food for themselves. This is the natural state of things, where no artificial impregnation nor care is exercised. By proper management, however, eighty to eighty-five fish out of the hundred can be hatched. After the navel-bag is absorbed, the necessity arises of furnishing food in greater

quantity than would naturally be procurable in the immediate vicinity of the imprisoned fish; but our author considers that all such preparations as chopped meat, clotted blood, etc., are objectionable for many reasons—among others, on account of the portion that is not consumed, which sinks to the bottom and remains in the water, rendering it corrupt.

Dr. Hartmann therefore recommends that if water-plants do not naturally grow in the neighborhood of the nurseries for the fish, they be immediately planted, since these attract and harbor immense numbers of minute insects and crustaceans; and if this be not sufficient, recourse must be had to more distant points. By using fine gauze nets, and sweeping the waters, a vast number of minute animals can be obtained, which are to be turned, while still living, into the nurseries, where the young fish will be found to devour them with the greatest greediness. The rapidity of reproduction of some water-insects is such as to furnish a continuous supply to large numbers of young fish—the progeny of a single fresh-water crustacean being multiplied to an almost incredible extent. During the first fourteen days after birth the small water-insects referred to should be the sole food of the brood, as this is the critical period of the nursery. A sufficient supply, according to our author, for 10,000 trout can be obtained in the course of one or two hours by pouring water with a dipper from one of these pools on to a bit of gauze stretched tightly at the four corners. After this, coarser food can be used, especially the larvæ of insects, which are readily obtained, including the musquito and other diptera. By collecting the eggs of frogs and toads, and placing them in pools, they will also furnish food, either directly or after their eggs have hatched out into tadpoles.

It is also recommended to separate the larger of the young fish from the smaller, as the former are likely to appropriate more than their share of the finer food, thereby retarding the development of the rest. Alluding to the voracity of certain fish, Dr. Hartmann quotes the observations of Coste upon trout, of which four, each an inch long, devoured 6000 embryos of perch in less than five days, or an average of 300 apiece each day.

In rejoinder to the above views by Mr. Hartmann, Mr. Wengen takes exception to the feasibility of obtaining nat-

ural food in the quantity needed in practical fish culture, remarking that, as the young of the salmon especially are hatched out in the winter season, the necessary quantity of larvæ and minute crustaceans can not be had. The only alternative remains, therefore, to furnish the young brood with artificial food, or else to turn them out into the stream on the absorption of the navel-bag. But Mr. Wengen found that grated calf's liver will answer every purpose, since but a few of the young fish perish before they get accustomed to this food, the larger number surviving and thriving upon it. In his opinion, however, if young fish are protected through the period of hatching, and until after the navel-bag has been absorbed, they may then be let out into the streams to take care of themselves, as by this time they have passed that period in their life when they are exposed to the greatest dangers.

The fertilization of the much larger proportion of eggs, which takes place in artificial impregnation, and the seclusion of the young, before the yolk-bag is absorbed, from their natural enemies, will give the larger percentage of the laying a chance to develop and become mature fish; although, of course, should the young be fed until they have materially increased in size, the proportion assured for the continuance of the stock is still greater.—2 *A*, *August* 26, 1871, 128, etc.

IRISH OYSTER FISHERIES.

A valuable contribution to the science of animal culture, if we may use the term, is found in the report of a commission appointed in Ireland to inquire into the methods of oyster culture in the United Kingdom and France, with a view to the introduction of improved methods of cultivation. This appears to be by far the most complete and practical account of the subject that has yet been published, including, as it does, the investigations prosecuted under public and private auspices in the different countries of Europe. After a discussion of the oyster fisheries of England, and giving a description of the different methods and places of culture, it remarks, in conclusion, that while not concurring in the opinion put forward by some as to the extraordinary profits to be realized from oyster cultivation, the commissioners believe that, if judiciously undertaken, and prudently and persever-

ingly carried out, it is profitable, and that there is much to encourage an enterprise of the kind. It also states that Ireland possesses external advantages for the culture, on account of the feeding process being attended with so little risk, and thinks that ten times the amount of oysters now actually gathered in Ireland could find a ready sale. A summary of the principal laws relating to oyster culture in different countries of Europe, with tables of temperatures and other information, concludes the report, which is well illustrated with drawings of the oyster in its different stages of growth, and plans of the localities where the business of oyster raising is prosecuted.

GRAPE-VINE DISEASE.

Most of our readers are aware of the outbreak of a new grape-vine disease in Europe produced by a kind of plant-louse, which, spreading from one region to another, threatens to almost paralyze the cultivation of that plant; but the fact is probably not generally understood that the pest in question is a native of the United States, and has been transplanted to the Old World, with the result referred to. Mr. Riley, the State Entomologist of Missouri, has lately published in the *Rural New Yorker* several articles on the subject, in which he discusses the history of this insect, showing that the first reference to it was by Dr. Fitch, of New York, in 1856 (who called it *Pemphigus vitifolia*), Mr. Riley himself writing about it in the *Prairie Farmer* in 1866, and succeeding articles also appearing by Mr. Shimer and Mr. Walsh. After this it attracted attention in the south of France, where its ravages became so great that the Minister of Agriculture offered a prize of $4000 for the discovery of a practical remedy. A special committee was nominated to investigate the whole subject, and the history of the insect has since that time become pretty well understood.

Referring to Mr. Riley's papers and other sources for the details in regard to the natural history of this pest, we may simply repeat the statement of this author, that it is to the presence of this insect in our soil that we owe the great difficulty in raising the European grape in America, as also some of the varieties of our own native species. It is found by experiment that certain kinds of vines are more liable to the

attack of this grape-leaf gall-louse than others; and an important application, according to Mr. Riley, may be made of this fact in regard to the selection of the proper kinds. The European vine, as is well known, thrives admirably in California, where it is cultivated on a large scale; but Mr. Riley thinks this is due to its having escaped a visit from the insect, and not from any natural immunity, and that, unless great care is taken, it will sooner or later find its way there.

In a second article in the *Rural New Yorker* upon this insect, Mr. Riley sums up its history by stating that we have had in this country from time immemorial an aphis-like insect attacking our native vines, either forming galls on the leaves, or gall-like excrescences on the roots. This insect is polymorphic, as many others of its family are known to be. It also exists in two types: the one, which may be termed *radicicola*, living on the roots; while the other, which may be termed *gallæcola*, dwells in galls on the leaves. The latter is found more especially on the Clinton and its allies, while the former is found on all varieties, but flourishes best on vines belonging to the *vinifera* species. The gall-inhabiting type was noticed and imperfectly described in 1856; but the root-inhabiting type, being less conspicuous, was unknown in this country till last year.

Such an insect is very readily transported from one country to another on grape-roots, seedlings, etc.; and just as our apple-root louse (*Eriosoma lanïgera*) was imported into Europe toward the close of the last century, so we find that our grape-louse was similarly imported, in all probability, within the last decade. In conclusion, he remarks that there is no occasion for unnecessary alarm, and that the knowledge of the disease will surely in time bring to us the proper remedy. The *Phylloxera* has always existed on our vines, and those varieties which have always resisted its attacks will be likely to do so in the future. The presence of a few such lice upon a plant is a matter of comparatively little moment, as they are injurious only when developed in an inordinate quantity. —*Rural New Yorker*, *October*, 1871, 251.

J. HOUSEHOLD ECONOMY.

COMPARATIVE PERIOD OF MELTING OF NATURAL AND ARTIFICIAL ICE.

The idea has been more or less prevalent that artificial ice is more readily melted than natural, and, consequently, that the values of equal weights of the two could not be compared, excepting the question of price be taken into the account. We are informed, however, that the French Navigation Company of the *Messageries Impériales*, wishing to test this question in reference to the ice to be used on its vessels in the Indian Ocean, have made experiments, taking one hundred kilogrammes of each kind, and exposing to the same temperature under similar conditions. The result is as follows:

	Hours.
Natural Swiss ice required for complete melting	107
Natural Norway ice required	115
Artificial ice of the Carré machine required	130
Natural ice from Boston required	138
Artificial ice of the Tellier machine required	144

If these experiments were conducted with such precautions as to be reliable, it would seem that, after all, one form of artificial ice lasted longer than any of natural origin.—3 *B*, *August* 4, 607.

ARTIFICIAL ICE IN PACKING FISH.

As might have been expected, artificial ice machines have been extensively called into play for the manufacture of ice to be used in packing fish. In corroboration of previous statements, it is said to be far more durable than natural ice, the crystals being much more solid, and exhibiting less tendency to split into flakes. The estimate has been made that thirty per cent. less of artificial than of natural ice will secure the same preservative effect. One objection to some forms of artificial ice is said to be the opacity of its color; but an inventor announces his discovery of a method by which perfectly transparent ice can be obtained, and for its publication

to the world he asks the modest sum of five hundred pounds sterling.—17 *A*, *September*, 1870, 133.

PRESERVATION OF DEAD SALMON FOR AN INDEFINITE TIME.

Of late years salmon have been quite abundant in our markets throughout the winter season, a period when previously they were unknown, owing to the fact of their being then, with few exceptions, in the deep waters of the sea. For this purpose they are taken in the summer months, when the fish are in the rivers and in best condition, and are packed in snow as soon as caught, and in that condition carried to the establishments where they are to be preserved. They are first overhauled and sorted, and then put into a room where, by means of a mixture of ice and salt placed between zinc plates, the temperature is kept many degrees below the freezing point. The fish are soon frozen, and can be kept in that state many months, and even years, provided the temperature be kept steadily down to the proper degree. In the winter season, the salmon thus frozen are shipped, properly packed in ice, being carried in that condition all over the country. It is said that the taste of these fish, if cooked directly after having been thawed, is fully equal to what it would be if eaten at the time of capture.—*Rept. Canadian Dept. Marine*, 1870, 60.

PRESERVING MEAT IN CANS.

A new method of preserving meat in tin cans, which is favorably commented upon, is that of Mr. R. Jones, of London. In this process the meat is first packed in its raw state into tins of any desired size. The lids are then soldered down, the top of each lid having a small tin tube in it, which communicates with the interior of the tin. These tubes are next inserted into the exhauster, which is a receptacle connected with a machine designated a "Torricellian vacuum," an apparatus in which the air is exhausted by the action of water. The tins are then placed in the cooking-bath, and at the proper juncture the vacuum is created and the meat thoroughly cooked, at a temperature varying from 180 to 228 degrees. At this stage another feature of the invention comes into play. The vacuum having been created, a supply of gravy is turned on from a receptacle, and the tins filled

with nutritious fluid. The feed-pipes of the tins are then nipped and the cases hermetically sealed. By thus filling the tins with the gravy, the difficulty of collapse, which has always prevented large tins being hitherto used, is obviated, while the whole space of the package is utilized. Testimonials from captains of ships and others who have used it are furnished by the inventor, certifying to the excellent quality of the meat. By this improved process the great objection of overcooking the meat has been obviated, and as now prepared it would seem to merit general approval.—17 *A*, *October*, 1870, 151.

PREPARED MEAT-EXTRACTS IN JAVA.

It has frequently been remarked that the best inventions of the Western nations have, in nearly every instance, been anticipated by processes long since devised and in use by the Orientals, especially by the natives of China and Japan; and we are assured that the subject of prepared meat-extracts takes its place in this category. We are informed by a recent communication of Dr. Pott that the inhabitants of Java have for many years been in the habit of preparing flesh extracts of various kinds, and especially of beef, fish, and crabs, and that in this form they enter very largely into the internal commerce of the country. The preparation is known by the general name of *petis*, while the particular substance, whether the flesh of one of three kinds of oxen, of fish, or of crabs, is indicated by a special affix.

The preparation of the petis appears to be a very simple one, consisting merely in boiling the raw material and chopping it very fine, and then putting it in a press and forcing out all the juices. This juice is then boiled down at a moderate temperature to the consistency of sirup, and kept for use. As a general rule, the preparation is made of such pieces of meat of all the animals used as when brought to market are not sold before its close, a precaution rendered necessary by the heat of the country, and the impossibility of obtaining ice, by means of which to carry the food over until the next day. The substance from which the petis is expressed is also dried and introduced into commerce, but is generally used immediately, while the petis is distributed widely throughout the Indian Archipelago, and can be kept

a long time. These preparations have an extremely saline taste, due almost entirely, however, to the concentration of the organic salts originally contained in the expressed juice. The smell is said to be quite agreeable, and the taste very appetizing.—8 *C, July* 28, 1871, 233.

USE OF FLESH OR MILK OF APHTHOUS CATTLE.

Professor Dammann has lately renewed, with great care, the inquiry as to the wholesomeness of flesh or milk of cattle that have been afflicted with the foot and mouth disease, and has come to the conclusion that the use of these substances can not be forbidden with sound reason. He states that the flesh is absolutely harmless, and its use should be allowed under any circumstances, taking care in every case that the slaughtering be done in one and the same place, in order that no new locality be unnecessarily tainted by the liquids resulting from the operation.

In reference to using the milk, he states that, should any misgiving be felt, it may be converted into butter or cheese, in which case it is absolutely harmless. No reliable instances could be found, in the course of a long and careful inquiry, of any infection or disease having been communicated to mankind or the lower animals by eating the flesh of animals thus afflicted, or by drinking their milk. The author concludes by saying that it is eminently right and proper that legal and other precautions be taken against the propagation of the disease in living animals, but that these measures should always be subordinated to the general principles which have now been fairly established.—10 *C, February* 1, 17.

PELOUZE PROCESS OF PRESERVING MEAT.

Notices have from time to time appeared in reference to a method devised by Pelouze for preserving meat unchanged for an indefinite period of time without the use of any chemical solution, and to his having deposited an account of it with the secretary of the Academy of Sciences in Paris. In a late number of the *Moniteur Scientifique* the secret is announced, from which we see that it is not essentially different from processes already in use. For the purpose in question, the meat is to be cut up into pieces of convenient size, and subjected to an atmosphere of carbonic oxide under pressure.

After this a current of dry air is passed over the meat, so as to carry off all the moisture, and this being accomplished, a solution either of salt or saltpetre, or much diluted carbolic acid, is to be brought into contact with it, and the mass then sealed up in a tight vessel.—1 *A*, *April* 21, 191.

ASEPTIN.

A substance called *aseptin* has been introduced into trade by a Swedish dealer as a preservative material for milk, meat, etc. This is said to be simply boracic acid, or borax; the double aseptin consisting of two parts of borax to one part of alum. Putrefaction is said to be prevented by the addition of this preparation, but mouldiness in animal substances is not. Although a very short time has elapsed since aseptin has been brought into notice, thousands of pounds are now sold almost daily in Scandinavia and Germany.—6 *C*, xxv., *June* 22, 248.

KEEPING FISH FRESH WITH SUGAR.

A method adopted in Portugal for preserving fish consists in removing the viscera and sprinkling sugar over the interior, keeping the fish in a horizontal position, so that the sugar may penetrate as much as possible. It is said that fish prepared in this way can be kept completely fresh for a long time, the savor being as perfect as if recently caught. Salmon thus treated before salting and smoking possess a much more agreeable taste, a table-spoonful of sugar being sufficient for a five-pound fish.—10 *C*, VII., *July*, 1871, 91.

CARBOLIC ACID FOR PRESERVING MEAT.

Dr. Baudet, in the *Moniteur Scientifique*, communicates the result of some experiments made with a weak solution of carbolic acid in preserving meat. For this purpose he took four wide-mouthed stoppered bottles, and placed in each half a pound of raw horse-flesh, slightly moistened with solutions of carbolic acid varying in strength from five parts to one part in a thousand. In each bottle he put a few small pieces of charcoal for the purpose of absorbing any gaseous matter evolved from the meat. After keeping these bottles three months in a room constantly heated to a temperature of about 70 degrees, he found, at the end of that time, that no decom-

position had occurred, and that the flavor of the meat was fully preserved—to such an extent, indeed, that it was considered excellent by himself and his friends who partook of it. No taste was imparted to it by the acid different from that which attaches to ordinary smoked meat, and the experimenter was of the opinion that this substance may be used with great advantage for the preservation of flesh on a large scale for a considerable period of time. He thinks, however, that this should be kept in well-closed vessels, although it is not necessary, perhaps, that they be hermetically sealed. —1 *A, March* 31, 148.

SOUP TABLETS.

The Chemical News gives us from the German Manuals of Pharmacy the following receipt, by Reinsch, for making the soup tablets so much in use in the German army during the late war. The formula is as follows: Take eleven parts by weight of good suet, melt it in an iron pan, and make it very hot, so as to become brown; add, while keeping the fat stirred, eighteen parts of rye meal, and continue heating and stirring so as to make the mass brown; add then four parts of dried salt and two parts of coarsely pulverized caraway seed. The mixture is then poured into tin pans somewhat like those used for making chocolate into cakes. The cakes have the appearance of chocolate, and are chiefly intended for the use of soldiers while in the field. A quantity of about one ounce of this preparation is sufficient to yield, when boiled with some water, a ration of good soup; and in case of need, the cakes, being agreeable to the taste, may be eaten raw.—1 *A, March* 3, 107.

TAPIOCA BEEF BOUILLON.

According to the Scientific Review, a London firm, entitled the "Tapioca Beef Bouillon Company," manufactures a very palatable and nutritious compound which, by the mere addition of water, is converted into soup. It is the invention of Mr. Geyelin, and consists of granulated Brazil tapioca saturated with Liebig's extract of beef, and thoroughly dried. Each canister contains the quantity necessary for a pint of good soup; and as five of these canisters are sold for a shilling sterling, this "tapioca beef bouillon" is obviously within

the means of all. Having tasted both that which was unseasoned and that seasoned with vegetables, the writer in the Review expresses his preference for the former, which, in his opinion, makes a soup fully equal to that supplied by many confectioners at six times the price. As a summer food for those who dislike semi-putrid meats, and can not afford to waste any thing, the new food is recommended as worthy of general use. It is stated that this bouillon was largely furnished to both the French and German armies and ambulances, and that it gave the greatest satisfaction both to the medical men and their patients.—8 *A*, *May* 1, 89.

PRESERVATION OF MILK IN RAILWAY TRANSPORTATION.

Among the precautions taken by an extensive milk company near London to insure the safe transportation of milk and cream by railway, that to which the most importance is attached consists in the cooling of it to the temperature of 50° to 59° Fahr. before filling the cans. Should the milk be placed in the cans at a higher temperature, as from 70° to 82°, the motion of the cars will cause the butter to separate as well as to produce a deposit of casein, which change need not be apprehended when milk is at the lower temperature indicated. A farther requirement is to have the vessels completely filled with the milk, and closely fastened. Sometimes a small proportion of bicarbonate of soda is added to the milk in hot weather, with important results in preventing it from turning sour.—9 *C*, *June*, 1870, 43.

PRESERVING THE FLAVOR OF BUTTER.

The *German Agriculturist* says that a great portion of the fine flavor of fresh butter is destroyed by the usual mode of washing, and he recommends a thorough kneading for the removal of the buttermilk, and a subsequent pressing in a linen cloth. Butter thus prepared, according to our authority, is pre-eminent for its sweetness of taste and flavor, qualities which are retained a long time. To improve manufactured butter we are advised by the same authority to work it thoroughly with fresh cold milk, and then to wash it in clear water; and it is said that even cold and rancid butter may be rendered palatable by washing it in water to which a few drops of a solution of chloride of lime have been added.—10 *C*, 1871, IV., 47.

COLORING FOR BUTTER.

According to the *Moniteur Scientifique*, a coloring matter much superior to the annotto for coloring butter may be prepared from carrots. For this purpose the roots are to be cut in slices and dried, and afterward ground to powder, and subjected to the action of sulphide of carbon. An extract can be obtained in this way which, rapidly crystallized, furnishes pure carotine, an insipid, inodorous substance, resembling alizarine in appearance.—1 *A*, *March* 17, 130.

EGG-OIL.

Few of our readers are aware, we presume, that an oil can be made from the yolk of eggs, or that this is manufactured or used in any quantity. We are informed, however, that such is the case in Russia, and that a large quantity is there prepared for various purposes. The better qualities are used for salad-dressing, and considered very much superior to olive-oil; while from the more common kinds is manufactured the well-known Kasan soap. Both articles are too expensive for ordinary use, the soap especially, which is only employed among the cosmetics and toilet articles of the wealthy Russian ladies.—7 *C*, *G* 71, v., 304.

PRESERVING EGGS.

The French *Journal de Pharmacie* contains an account of various experiments made in France on the best method of preserving eggs — a subject of much importance there. Among the different processes, the best, and at the same time one of the simplest, was found to consist in rubbing some vegetable oil (linseed especially) on the egg, this preventing any alteration for a sufficient time, and proving to be much more satisfactory than any other plan hitherto recommended. —17 *A*, *October*, 1870, 151.

EFFECT OF KEEPING FLOUR IN BARRELS.

As is well known, flour kept in barrels for a long time often acquires a peculiar odor, supposed to be derived from the barrel. Professor Poleck, of Silesia, has lately made a careful examination of such flour, and has ascertained that this smell actually indicates an incipient decomposition prejudi-

cial to bread-making, the gluten of the flour having in part become changed into a soluble body. Thus, while sound flour preserved in sacks contained 11.06 per cent. of gluten and 1.44 per cent. of soluble albuminous matter, four other specimens of flour taken from different barrels were severally composed of 8.37 per cent. gluten to 2.14 per cent. soluble albumen; 7.40 per cent. to 6.90 per cent.; 7.23 per cent. to 4.44 per cent.; and 6.54 per cent. to 6.46 per cent. Two samples with more than 6 per cent. of soluble matter had an acid reaction, while the others were neutral. Professor Poleck believes this chemical change of the flour to be induced by the fact that the barrel prevents communication with the atmospheric air and the equalization of temperature. This view is confirmed by the oft-repeated observation that flour in sacks keeps fresh for a much longer time, and that the mustiness in barrels always develops first, and exists in the highest degree in the centre, viz., that portion most remote from the outer air.—19 *C*, xx., 193.

BREAD.

A German scientific journal contains the results of an elaborate series of experiments on the effects of feeding dogs and man on bread alone, and on bread mingled with meat and other articles of diet. These experiments, it is stated, prove that a bread diet alone is very expensive, as a large quantity must be given to supply the daily waste of the fleshy tissues. On the other hand, the addition of a small quantity of meat reduces the cost of support and keeps up the strength of the body. Insufficient food, it is demonstrated, causes the tissues of the body to become more watery, and renders the entire organism less capable of resisting injurious influences. In the experiments on man, the attempt was made to ascertain which of the several kinds of bread in ordinary use was absorbed in the greatest amount in its passage through the alimentary canal. It was found that white wheat bread was absorbed in the greatest amount, then leavened rye bread, then rye bread raised by chemical processes, and, lastly, the "pumpernickel," or German black bread. The great nutritious value attributed to bran is denied by the experimenter. —12 *A*, 1871, *April* 20, 497.

FRENCH PRESERVED BREAD.

A new article called preserved bread has lately been introduced in Paris as a substitute for biscuit, or hard-tack, for travelers, and for naval and military commissary stores generally. Bread prepared in the ordinary way is first submitted to a drying process for from eight to fifteen days, until every particle of moisture is eliminated. It is then compressed to the utmost, so as to occupy the least possible bulk, having been previously exposed for a short time to the action of steam in a suitable vessel. The loaves are then piled up upon iron plates with rims, which serve as moulds during the operation. These plates are then placed under a hydraulic press, subjected to great pressure, and allowed to cool there during twenty-four hours. The cakes thus obtained are placed in boxes, sealed up, and, if kept from moisture, can be preserved for many years. This bread has a vitreous fracture, but the teeth penetrate it without effort. It softens readily in soup, and for many purposes is very much superior to the preparations usually employed under the same circumstances, especially on account of being leavened.—2 *B*, *June* 11, 663.

COLORING MATTER OF WINE.

A method of distinguishing genuine red wine from the false, according to Cotteni, consists in mixing fifty parts of the liquor to be tested with six parts of nitric acid of 1.40 specific gravity, and heating the mixture to 190° or 200° F. Under these circumstances natural wine experiences no change after the lapse of an hour, while that which has been artificially colored loses its tint in five minutes.—14 *C*, CC., III., 242.

PRESERVATION OF BEER.

The method of preserving wine devised by Pasteur, which consists in heating it, after having been bottled up or put up in casks, to a temperature sufficient to destroy the vitality of any existing spores of the wine fungus, and thereby to prevent their development, marked a new era in the business of wine-making; the treatment recommended having been followed with great success, and coming more and more into

use. Quite recently the same principle has been made use of in regard to beer, which is still more liable than wine to become sour. In this case, too, the success has been complete, and immense quantities of malt liquors of various kinds, after having been subjected to the process, are now shipped from Germany to all parts of the world. The bottles, after being filled and well corked, are kept for about half an hour in a water-bath having a temperature of 122° Fahrenheit, after which the warm water is gradually replaced by cold, so as to prevent too rapid cooling. In one of the experiments instituted for determining the feasibility of the operation, four bottles of the same kind of beer were well corked, and two of them were submitted to the process in question, after which all were introduced into a heated room in the vicinity of a stove, and kept at a temperature of between 70° and 80° for four weeks. At the end of this time the prepared beer was found to be perfectly clear and of a golden tint, with only a slight deposit of granular matter at the bottom. The unprepared beer, however, was found to have passed into an active state of fermentation, turning completely sour, and one of the bottles had burst in consequence. It is requisite, however, in preparing beer by this method, that the corks be perfectly tight, and for this purpose the best Champagne corks must be selected, and, if possible, soaked in a hot solution of paraffine and some resin (as colophony), a composition which melts only at a temperature of 120°. In this way the entire percentage of carbonic acid of the beer will be retained in the bottle, and the beer will be found capable of preservation for an indefinite period of time. It is said that beer of any quality can be kept in this way, the lightest and weakest being as susceptible of preservation as any other.—9 *C*, *October*, 1870, 77.

RESTORING SOUR BEER.

It is said that beer or ale that has been soured by the conversion of a portion of its alcohol into acetic acid may be restored by passing it through a column of vegetable matter, packed in a suitable vessel. Dried grains, wheat chaff, bran, or other vegetable substances may be used as the filtering material, and will be found, it is asserted, to retain the acid. —8 *A*, *October* 1, 185.

RICE BEER.

The practice of brewing beer from rice is rapidly coming into use in Germany. This beer is said to be of a very clear, pale color, of an extremely pleasant, mild taste, foaming strongly, and yet retaining well its carbonic acid.—1 *A*, *December* 23, 311.

CLEANING OF BEER BOTTLES.

It is said that the hard crust or deposit that forms in beer and wine bottles, adhering sometimes with extreme tenacity, may be very readily removed by washing them in a solution of permanganate of soda; or, if necessary, allowing this to stand for a time in the bottle. The separation will be facilitated by the free use of the ordinary bottle brush.—13 *C*, *July* 15, 1007.

TANNIN IN THE MANUFACTURE OF BEER.

Tannin as obtained from the grape is now much used in the treatment of wine, for the special object of arresting fermentation and preventing change beyond a desired point. A similar application has also been made with much success in the preparation of beer; and the result, according to critical authority, has been to establish a new epoch in this manufacture. It is to the presence of tannin in the leaves of the hop that its preservative peculiarities are due; and in the tannin of the nut-gall we have the same agent in greater intensity, 75 grains of tannin exerting as positive an action upon beer as a pound of the best hops. By taking tannin dissolved in ten times its weight of warm water and adding it to the wort, a complete clarification will take place, and on cooling a deposit will be thrown down. In all cases where the peculiar aroma and bitter substance of hops are not desired, but a sweet wine or beer is to be produced, the hops can always be replaced completely and with advantage by the tannin. The use of this new material allows the manufacture of several new kinds of beer, and obviates the necessity of using any other modes of clarifying.—5 *C*, xxvi., 208.

PASTEUR'S MODE OF PREPARING VINEGAR.

The researches of Pasteur, in regard to the microscopic growths that affect the silk-worm, the vine, wine, etc., are well known to many of our readers, but they may not be so familiar with one of his many important practical applications of science to the economical manufacture of an excellent quality of vinegar. His method has been practiced in an extensive establishment in Orleans, France, for some time past, under his direction, although it is but recently that the details of the process have been made known. The apparatus employed consists of as many tubs, holding about thirty gallons each, as can conveniently be accommodated in one room, kept heated to a temperature of 70° to 80°. These are filled with a mixture of vinegar and wine, and the vinegar fungus is planted, or sown, upon the surface. This is an application of the fact, established by Pasteur, that the conversion of wine into vinegar is caused by the development in the liquid of the so-called vinegar fungus, or *Mycoderma aceti.* This planting, or sowing, is accomplished by the use of thin wooden spatulas, previously moistened to prevent adhesion, and then laid on the liquid covered by the fungus, so as to take off a thin layer, and afterward immersing this carefully in the unchanged liquid, and stirring round so as to carry the fungus to the bottom. This soon rises to the surface, which is completely covered by it in about eighteen hours. With the development of the plant the manufacture begins, accompanied by a considerably concomitant development of heat. In the course of nine or ten days, and sometimes in eight, the entire liquid is transformed into vinegar, the completion of the operation being shown by the tearing apart of the fungus layer, and its falling to the bottom. The vinegar, which by this time has become cold, is drawn off through an opening near the bottom of the tub, ninety-five parts of vinegar being obtainable from one hundred parts of the wine. When the vinegar is drawn off the tubs are to be well scrubbed out with clean water, so as to be entirely free from all particles of fungus; they are then ready for a new mixture of wine and vinegar. The advantage of this method consists in its simplicity and in the ease with which the work can be prosecuted; the first results being obtained in ten days, and the whole com-

pleted in twelve or fourteen. In the old methods it was necessary to add a very large proportion of vinegar to the wine in order to transform a small quantity of the latter, so that from one tub of one hundred quarts only nine quarts of vinegar were furnished weekly; while by the new method nine and a half quarts can be furnished daily, or sixty-six in a week, being seven times as much as by the old method. In consequence of the more rapid preparation by the new process, the vinegar is less aromatic when completed, but very soon acquires this important quality.—6 *C*, XXIV., *June* 15, 234.

GREEN COLOR IN PICKLES.

It is said that, to impart an excellent green color to pickles, they must be first covered with boiling hot salt water, and after a short time the water poured off and the pickles drained. They are then to be placed in an earthen pot and covered with boiling vinegar, the top put on, and the whole kept at a lukewarm temperature for a long time, the vinegar being poured off every day, heated to boiling, and turned again upon the pickles. This is to be continued until the color is a beautiful green. The vinegar used in this process is then to be poured off and replaced by fresh, and the jar closed tightly. This method of coloring is perfectly harmless, although the result is as bright a green as that of verdigris.—5 *C*, VI., 48.

VINEGAR FROM UNRIPE FRUIT.

Unripe fruit, especially apples and pears, as is well known, is much used in the manufacture of vinegar, but the process usually adopted is defective in many important points. We therefore give, for the benefit of our readers, the substance of an article, from Graeger's Manual of Vinegar Making, just published in Germany, which may, perhaps, serve a useful purpose. The principal fault of the old process consists in throwing away the pulp after the juices are expressed. As this, however, contains a large percentage of starch, excellently adapted for conversion into vinegar, it is necessary to prepare the fruit so as to save this portion of its substance. With this object it is to be grated, exactly as potatoes are prepared in the manufacture of starch, and the pulp passed through a moderately fine sieve, or through a coarse and open meshed cloth. There is thus nothing left behind but the pom-

ace proper, or cellulose, all the starchy matter having been passed through the sieve with the juice. This is next to be diluted with water, in proportion to the quantity of starchy matter thus obtained, and the whole is then placed in a clean copper kettle, one or two per cent. of concentrated sulphuric acid being added, and heated long enough to transform the starch into grape sugar. The sulphuric acid is to be neutralized by means of carbonate of lime; the gypsum or the sulphate of lime thus produced allowed to settle, and the liquid to become clear, and then poured off. The liquid is to be left for fermentation to take place, either with or without the use of yeast. A liquid having eight or ten per cent. of sugar can easily be made to have four or five per cent. of alcohol after fermentation, which, by its subsequent acidification, will yield a vinegar of five to six per cent. of acetic acid. —8 *C*, *Feb.* 16, 54.

NEW ARTICLE OF CONCENTRATED FOOD.

A concentrated preparation of food, somewhat similar in composition and character to the celebrated "peas pudding" used in the late French and German war, is made by Mr. Batty, of England, by first reducing peas to a fine state of division, either by boiling and then rubbing them down, or by grinding into meal. To this meal he adds a quantity of Liebig's extract of beef and a small quantity of the concentrated essence of meat. He then introduces a mixture of fresh vegetables, such as carrots, turnips, onions, etc., reduced to a pulp. Mint may be introduced in the form of dry powder, and celery may be used in the form of an essence. Pepper and other condiments are added to suit the taste, and salt as may be required.—8 *A*, *June* 1, 118.

TIN-FOIL FOR PRESERVING LEMONS.

Tin-foil has long been used with excellent effect as a preservative from the air of various substances that require such exclusion, especially such as chocolate, tobacco, cocoa-butter, efflorescent and deliquescent salts, etc. Quite recently a new application has been made of it in the preservation of lemons, which, as is well known, soon become dry and hard when exposed to the air, and ultimately parchment-like and covered with mould. The foil, however, has the effect of preventing

such drying up, and of keeping the lemons fresh for an indefinite period of time. In one experiment, after an interval of two months, the lemons had only lost one and a half per cent. of their weight, and in three months little over three per cent., and in some cases even less than this. Oranges, similarly treated, lost only about five per cent. in two months, and on the removal of the metal covering both kinds of fruit were found to be as fresh and fragrant as when the experiment commenced.—18 *A*, *Nov.* 18, 1870, 194.

PREPARATION OF DESICCATED VEGETABLES.

A convenient method of preparing desiccated vegetables, as practiced largely in some countries, consists in drying them for a short time and then exposing them to a slow heat in ovens. When soaked for cooking, peas, roots, potatoes, beets, corn, and other substances, swell out and show very little change in their esculent properties. A modification of the process consists in placing the substances, after being sun-dried, in paper bags, which are pasted up at the mouth, and then covered with sand and heated until perfectly crisp, but not burned nor materially changed in color.—18 *A*, *June* 16, 307.

PUTTING UP PRESERVED FRUITS.

A convenient method of closing up prepared fruits consists in placing them in stone pots somewhat narrowed at the upper end, pieces of paper being laid over the fruit in such a manner that when the top is applied there will be no opening into the interior. Some gypsum is then to be mixed with water, and poured in a liquid form over the cover to a depth of half an inch. In a few moments the gypsum hardens, and the jar becomes air-tight, and the contents, it is said, will remain unchanged for years, the exclusion of the air being much more perfect than by the ordinary methods of closing with India-rubber or with tin.—9 *C*, *January*, 1871, 5.

APPLICATION OF THE GERM THEORY TO MAKING PRESERVES.

Miss Lydia Becker, although best known as a writer on political economy and social science, gave a valuable hint during a recent discussion of the British Association upon the "Germ Theory," in which she showed its bearing upon

the making of preserves, and keeping mould from settling on the jam. According to the old practice of leaving the pots uncovered for several days, time was allowed for the germs in the atmosphere to descend and settle on the jam, which was a capital soil, and the result was a plentiful crop of mould. She therefore advised the ladies in the section, when making preserves, to cover up the pots while the sweetmeats were in a heated condition.—18 *A*, *August* 25, 562.

METHOD OF PREPARING FRUIT SIRUPS.

Some rules for preparing fruit sirups given by a German expert are perhaps worth a trial by our readers. To have fruit juices fit for preservation, it is necessary, in the first place, to select fully ripe and undecayed fruit, and after mashing the fruit it should receive an addition of five to ten per cent. of sugar, and then be left to undergo a slight fermentation. Pectine is precipitated in consequence of the production of alcohol, and the juice, after filtration, becomes perfectly clear, and is much improved in flavor and color. Raspberries, whortleberries, currants, cherries, etc., may be thus treated, but the delicate flavor of the strawberry requires some modification of the process. In this, two pounds of carefully picked strawberries (the wild strawberry of the woods is the best) are put into a glass jar with two and a half pounds of white powdered sugar, and occasionally shaken. The sugar extracts the juice, and the berries shrivel to a dry pulp, and, after filtering, the sirup is ready for use. Heating must be carefully avoided, as it would at once destroy the fragrance of the fruit. As to cherries, the so-called Morello is recommended, and, by leaving the cracked stones in the pulp, a flavor like that of bitter almonds will be imparted. To make sirup of the fruit-juice prepared as above indicated, our author advises us never to make use of any metallic vessels or spoons, and always to take best refined loaf-sugar in lumps, five parts of juice to eight parts of sugar constituting a good proportion. The lumps of sugar are moistened with just enough water to cause them to dissolve readily, when the remaining juice is added, and the whole is to be rapidly heated to boiling, which, however, must only be continued for a few minutes. With good sugar no skimming is necessary, and filtering through flannel or other woolen cloth, previously wetted

in water containing a few drops of sulphuric acid, and well wrung, will make the sirup perfectly clear. It is best to fill the preserve jars with the sirup when cold, but if it has been done when hot, the vessel must be filled up after cooling, as the vapor condenses on the portion of the vessel left empty, and, running down, dilutes the upper stratum of the sirup, thus making it more liable to spoil.—8 *C*, 1871, 14, 109.

IMMENSE GAS COOKING-STOVE.

The London Mechanics' Magazine gives an account of a gas cooking-stove, manufactured for the Earlswood Lunatic Asylum, and capable of preparing a dinner for one thousand persons. It measures sixteen feet in length, six and a half feet in height, and two and a half feet in depth, weighing about three tons, and is so constructed as to perform every variety of cooking required under any circumstances, with the exception of boiling or steaming, for which other provision is made in the asylum. The gas, when used, is mixed with atmospheric air, and the stove is calculated to consume one hundred and fifty feet of gas per hour. Many advantages are claimed for this stove, both on the score of economy and convenience. It is stated, as the result of experiment, that the loss of weight in cooking one hundred and eighty-four pounds of meat was only eighteen pounds, while the loss in cooking the same amount by a coal fire was thirty-four pounds.—3 *A*, *June* 17, 437.

SUGAR-CUTTING MACHINE.

We can all remember when ordinary loaf-sugar was broken up at home, frequently by means of a knife and a flat-iron, or less frequently, perhaps, by means of a chisel and hammer or mallet. After a time the operation was performed either at the manufactory or by the grocer, as a means of alleviating the labors of the housekeeper, although it was not until after a considerable interval that the sugar, thus treated, was furnished in cubical blocks of uniform size, as we now see it. Various forms of apparatus have been suggested from time to time for accomplishing this result, the principal object being to secure an equal division, and, at the same time, cause as little waste of the material as possible. An improved form of apparatus has recently been devised, in which the loaves

are first cut longitudinally into seven plates, and then into various broad and narrow strips, and ultimately into many cubical blocks of any desired dimensions, so that a given number—forty, fifty, or sixty, or more—shall weigh exactly a pound. The same machine sorts out the perfect cubes from those that are imperfect, and sifts the sugar filings into a receiver, and grinds up all the imperfect blocks into grained sugar of any desired degree of fineness, the whole being accomplished in the course of a few minutes.—13 *C*, *August* 11, 1219.

USE OF THE SKIN OF THE OPOSSUM FOR GLOVES.

The Australian papers are congratulating the people of that country upon the demand that has lately sprung up in England for opossum skins, to be manufactured into gloves, as they appear to furnish excellent material for this purpose. As the opossum is considered a great nuisance in Australia, by its destruction of trees and injury to orchards, gardens, etc., it is anticipated that the very great call for them will do much toward keeping these animals in subjection. It is hardly necessary to say that the species in question is very different from the well-known opossum of the United States. —17 *A*, 1871, 89.

LEATHER BOARDS.

Within a few years past, refuse leather, in the form of cuttings, scrapings, etc., from shoe and harness factories, has been utilized by being converted into leather boards, which are extensively employed at the present time in the United States and Europe for the manufacture of inner soles of shoes, and for other purposes where the material is not likely to be exposed to the wet. The process of preparing these boards consists in first cleaning the scraps, so as to free them from all foreign substances, and then softening them for a time in water, to which is added some adhesive substance, such as glue or gelatine. After being sufficiently softened, the scraps are laid upon tin plates of the proper size, having a rim all around, and arranged longitudinally and transversely, so as to make the strata nearly even, until the required thickness is obtained. A number of these plates are then placed one upon another, and subjected to a hydraulic pressure until the

separate fragments are united into a nearly uniform mass. After these layers have dried sufficiently they are passed under a roller, so as to smooth them off and give to them the external appearance of the original leather.—6 *C, June* 1, 216.

SIMPLE WASHING AND IRONING MACHINES.

An English contemporary describes a simple apparatus, to be used in washing, that certainly has the merit of great simplicity. It consists of a neat hand frame, about nine inches long by five inches wide, weighing about one and a half pounds, and having one plain and two corrugated rollers, or one corrugated and two plain rollers, between which are about three dozen patent knuckle rubbers. The clothes, being well soaked in a tub or machine, are spread upon the side of the tub, or upon a washing-board, and the machine drawn quickly over them until the dirt is washed out. The clothes are then taken out of water, and the operation repeated, by which means they are pressed dry and made ready for hanging out. No hand-rubbing is needed, and it is stated that any one can use it. There is said to be no noise made in the operation, nor any strain or violence to the linen. Another article of similar utility is a simple contrivance, consisting of an under frame about sixteen inches long, having two plain rollers, to be used on a board or table as a smoothing and mangling apparatus.—18 *A, October* 14, 80.

REMOVAL OF GYPSUM FROM WATER.

An easy method of removing gypsum from water consists in the application of the native carbonate of baryta, ground to a fine powder, in the proportion of about half a pound to a large pailful. After the addition of this substance the water is well stirred, and left at rest for twenty-four hours to deposit the sediment, after which it is to be poured off, and may be used.—1 *A, February* 11, 1870, 70.

IMITATION OF HUMAN HAIR.

In an article upon the trade in human hair the author states that a patent has recently been taken out for converting goat's hair into hair for ladies' use, and that the experiment is so successful as to render it almost impossible to distinguish the real article from the imitation. This will be

good news not only to the dealers in hair, who might apprehend the exhaustion of their source of supply, but also to the ladies who depend upon art to compensate the deficiencies of nature. The same article states that in 1868 over 22,000 pounds of hair were imported into Great Britain, representing the clip of about 45,000 women. Much of this is obtained from the large communities of sisterhoods scattered throughout France and Belgium.—17 *A*, *October*, 1870, 149.

USE OF SULPHATE OF BARYTA IN WHITEWASHING.

Sulphate of baryta, or the so-called "fixed white," is strongly recommended as a substitute for lime in whitewashing. For this purpose an ounce of glue is to be softened for some hours in cold water, and afterward heated in a water-bath with a quart of water, until completely dissolved. At the same time, six or eight pounds of fixed white are to be stirred up with warm water in another vessel to a kind of milk, and the two poured together, and applied warm with a whitewash-brush or otherwise.—13 *C*, *August* 1, 1067.

PETROLEUM IN DRY ROT.

According to Herbst, petroleum may be applied with excellent advantage in the extirpation of the dry rot, it being only necessary to paint the surface of wood thus affected with the petroleum. A solution of carbolic acid, however, answers the same purpose, and involves much less danger from fire.—15 *C*, xx., 1870, 336.

RENDERING FABRICS UNINFLAMMABLE.

Mr. A. Patera, of Vienna, recommends the application of a mixture of borax and Epsom salts, or a mixture of sulphate of ammonia and sulphate of lime, as the best method of rendering woven fabrics and clothing generally uninflammable. —6 *C*, 1871, 118.

RENDERING STARCHED ARTICLES LESS COMBUSTIBLE.

If a solution of sal ammonia and gypsum be added to the starch used in doing up linen or cotton clothing, these become considerably less inflammable, according to the experiments of Mr. Patera, and, though not rendered incombustible, the danger from fire is greatly diminished.—8 *C*, 1871, XVI., 137.

RENDERING WOOD LESS COMBUSTIBLE.

Mr. A. Patera recommends the solution of the following substances in water for the purpose of application to wood to render it incombustible, experiments with all being equally satisfactory: 1. One third part of sulphate of ammonia, and two thirds of sulphate of lime (gypsum). 2. Equal parts of borax and Epsom salts. 3. A concentrated solution of soluble glass, without any admixture. Wood supplied with a coating of any of these solutions, according to Mr. Patera, will be measurably protected against the spread of fire.—18 *C*, 1871, XVI., 127.

CLEANING SOILED MARBLE SLABS.

Much annoyance is frequently experienced by the soiling of marble table-tops or other marble objects, and a perfectly satisfactory method of removing such stains is still a desideratum. It is said that if slacked lime be mixed with a strong solution of soap into a pasty mass and spread over the spot in question, and allowed to remain for twenty-four to thirty hours, then carefully washed off with soap and water, and finally with pure water, the stain will be almost entirely removed, especially if the application be repeated once or twice.

Another preparation consists in mixing an ox-gall with a quarter of a pound of soap-boiler's lye, and an eighth of a pound of oil of turpentine, and adding enough pipe-clay earth to form a paste, which is then to be placed upon the marble for a time, and afterward scraped off; the application to be repeated until the marble is perfectly clean. It is quite possible that with all our endeavors a faint trace of the stains may be left; but it is said that this will be almost inappreciable. Should the spots be produced by oil, these are to be first treated with petroleum for the purpose of softening the hardened oil, and the above-mentioned applications may be made subsequently.

Ink spots may be removed by first washing with pure water, and then with a weak solution of oxalic acid. Subsequent polishing, however, will be necessary, as the lustre of the stone may become dimmed. This can be best secured by very finely powdered soft white marble, applied with a linen cloth first dipped in water and then into the powder.

If the place be subsequently rubbed with a dry cloth the lustre will be restored.—13 *C, May*, IX., 596.

REMOVAL OF SPOTS AND STAINS FROM CLOTHING, ETC.

In an elaborate article published in the German *Muster Zeitung* upon the eradication of spots of different kinds from clothing, we are informed that benzine is undoubtedly by far the best and cheapest substance for removing grease, resin, stearine, paraffine, tar, wagon-grease, etc., the purest kind to be applied to the more delicate fabrics. Ether and petroleum ether are said to be of almost equal efficiency in this respect. Such spots are often complicated by the adhesion of dust or other matters, which, even if insoluble themselves, readily fall off when the substance with which they are combined is removed. For spots of oil it is best to add a little alcoholic ether. Silver spots and indelible ink can be removed, even after a long time, by means of cyanide of potassium or iodide of potassium applied in a concentrated solution. Rust spots can be made to disappear by treatment with a weak solution composed of one part nitric acid and twenty-five of water, and afterward rinsing with water and ammonia; copper spots by diluted sulphuric acid and ammonia, and subsequently with water and ammonia. Spots of paint, when not soluble in water and alcohol, can almost always be removed by oil of turpentine. For complete removal, it is necessary to wash the spot afterward in a good deal of turpentine. Fruit, wine, and similar spots are to be treated by sulphurous acid, which may be replaced sometimes, but not always, by chlorine. The acid may be applied either in the form of gas or dissolved in water; in the first case the substance to be treated is to be stretched at the proper height over burning sulphur, and in the latter moistened with the solution and then washed with pure water. For fine white table-cloths the dilute acid is preferable. Printing-ink can be readily taken from any article by means of ether or oil of turpentine. Pure benzine will also have a similar effect. Spots produced by alkalies, such as soap-boiler's lye, soda, ammonia, etc., can generally be made to disappear completely by the prompt application of dilute acetic acid and a good deal of water. Spots produced by hydrochloric or sulphuric acid can be removed by the application of concentrated ammonia, while spots from nitric acid can scarcely be obliterated.

For removing the stain of perspiration, a strong solution of soda is first to be applied, with a subsequent rinsing with water. Spots from sulphur and phosphorus, caused by lucifer-matches, can be extracted by sulphide of carbon. Ink spots are to be treated with oxalic acid, nitric acid, or chlorine, according to the composition of the ink. As a general rule, a solution of oxalic acid applied, and then rinsed off with water, will answer the purpose. The removal of actual coloring matter, such as the aniline dyes, etc., is more difficult, in consequence of the adhesion of the coloring matter to the substance of the fibre.—25 *C*, xx., *May* 24, 166.

WHITENING FLANNEL.

It is said that flannel, which has become yellow by age, may be restored to its original whiteness by the use of a solution of one and a half pounds of white Marseilles soap in fifty pounds of soft river water, to which is added two thirds of an ounce of spirit of aqua ammonia, and the whole thoroughly mixed. The flannel is to be immersed in this solution and well stirred around, and afterward washed off in pure water. The same result may also, it is said, be obtained still more quickly by immersing the flannel for an hour in a dilute solution of acid sulphate of soda, and then stirring in dilute hydrochloric acid in the proportion of one part of acid to fifty of water. The vessel is then to be covered over and allowed to remain for a quarter of an hour, when the articles are to be removed and thoroughly washed.—8 *C*, *April* 21, 127.

REMOVAL OF GREASE SPOTS.

In removing grease spots from fabrics by means of benzine or petroleum, it often happens that a colored and stained outline of the portion moistened is left. This can be prevented by the application of a layer of gypsum extending a little beyond the moistened region. When dry, the powder is to be shaken and brushed off, when no trace of the spot will remain.—6 *C*, XXVIII., *July* 13, 272.

CLEANING STRAW MATTING AND OIL-CLOTH.

It is said that straw matting may be kept new-looking and bright by washing it twice during the summer with a warm solution made by dissolving a pint of salt in half a pailful of

soft water, the object of the salt being to prevent it from turning yellow. After washing, the matting should be quickly dried with a soft cloth.

It is also said that by wiping oil-cloth all over, after being scrubbed and dried, with a cloth dipped in milk, the colors will come out clear and bright, and remain distinct throughout the year. This does not "track off" like oil used for the same purpose.—18 *A*, *June* 2, 271.

REMOVAL OF WALNUT STAINS FROM THE HANDS.

The removal of walnut stains from the hands may be ac-accomplished simply by rubbing with slices of apple or of pear; the cleansing power being due, it is supposed, to the presence of the acid, which therefore may, perhaps, be advantageously replaced by citric acid or lemon-juice. If, however, the stains be at once thoroughly washed in fresh water, without using soap, they may be made to disappear almost entirely; but soap is unadvisable, since its alkali acts as a mordant, and fixes the color.—8 *A*, *December*, 1870, 223.

REMOVAL OF MOULD FROM LINEN.

Spots of mould on fabrics can, it is said, be removed from cotton or linen by first rubbing them over with butter, and afterward applying potassa moistened with a little water, and then rubbing the spot, when all traces of it will disappear.—9 *C, December*, 1869, 95.

REMOVING IRON-MOULD FROM FABRICS.

A writer in the *Chemical News* advises, as the best method of removing stains of iron-mould from fabrics, that the mark be first wet with yellow sulphide of ammonia, by which it will be immediately blackened. After allowing it a minute or two to penetrate, the excess of sulphide is to be washed out, and the black spot treated with cold dilute chlorohydric acid, by which it is at once removed. Finally, wash well with water. This method is said to avoid the serious objection of weakening and rotting the fibre.—1 *A*, *June* 24, 300.

INK-PLANT OF NEW GRANADA.

Among vegetable substances useful in the arts is one that has long been known in New Granada under the name of the

ink-plant, as furnishing a juice which can be used in writing without previous preparation. Characters traced with this substance have a reddish color at first, which turns to a deep black in a few hours. This juice is said to be really less liable to thicken than ordinary ink, and not to corrode steel pens. It resists the action of water, and is practically indelible. The plant is known as *Coryaria thymifolia.*—5 *A, July*, 313.

COLORS FROM WILD PLANTS.

A German writer shows that a great variety of colors and dyes can be readily obtained from common plants found almost every where, the method consisting principally in boiling them in water at a high temperature, so as to produce a strong decoction. Thus, for instance, the well-known huckleberry, or blueberry (*Vaccinium*), when boiled down, with an addition of a little alum and a solution of copperas, will develop an excellent blue color. The same treatment, with a solution of nut-galls, produces a clean dark brown tint, while with alum, verdigris, and sal ammoniac, various shades of purple and red can be obtained. The fruit of the elder (*Sambucus niger*), so frequently used for coloring spirituous liquors, will also produce a blue color when treated with alum. The privet (*Ligustrum vulgare*), boiled in a solution of salt, will furnish an excellent color, while the overripe berries yield a scarlet red. The seeds of the common burning-bush (*Euonymus*), when treated with sal ammoniac, produce a beautiful purple red, while the juice of the currant, pressed out and mixed with a solution of alum, will furnish a bright red color. The bark, treated in the same way, produces a brown. Yellow can be obtained from the bark of the apple-tree, the box, the ash, the buckthorn, the poplar, elm, etc., when boiled in water and treated with alum. A lively green is furnished by the broom-corn (*Spartium scoparium*), and brownish-green by the genista.—10 *C, January* 14, 1871, 5.

OINTMENT FOR GUN-BARRELS ON THE SEA-SHORE.

It is said that an ointment made of corrosive sublimate and lard will prove an effectual protection against the rusting of gun-barrels on the sea-shore.—18 *A, August* 25, 571.

IMITATION CEDAR CIGAR-BOXES.

In Germany, cheap cigars are put in boxes made of ordinary wood, and stained so as to imitate the conventional cedar boxes of the tobacconist. To effect this imitation, some catechu is dissolved in twenty parts of its weight in boiling water, then strained and again brought to a boil, and a concentrated solution of the double bichromate of potash stirred into it. The color can be varied by the dilution of this mixture, and the quantity of the bichromate added. When this is applied fresh and warm to dry white wood, the effect of the cedar can be very closely imitated.—5 *C*, XXXIII., 264.

IMPROVED ENVELOPE.

A form of envelope has recently become quite popular in Germany, and possesses the convenience of enabling one to open a letter when completely sealed up, without the ordinary difficulty of finding an entrance. The arrangement consists in introducing a thread, which projects from one of the corners, by pulling which the lower edge of the envelope is cut through without injury to the inclosure, the address, or the stamp.—8 *C*, 1870, *April* 21.

FITTING CANDLES INTO SOCKETS.

Many of our readers have experienced the inconvenience of using candles, which, being too small for the sockets of the candlestick, are liable to drop out at an unpropitious moment, or else, being too large, it becomes difficult, if not impossible, to insert them so as to be securely fastened. As a question of important domestic economy, a recent German writer condescends to show how this trouble may be avoided. He remarks that the only certain mode of effecting the adhesion of the candle to the candlestick is by melting the one into the other. For this purpose, if the socket be too large, the candle is to be lighted and held in an inverted position over the socket sufficiently long to cause a considerable amount of melted material to drip into it, whereupon the basal end of the candle is to be inserted and held until the melted portion is cooled. The connection of the two will then be so great that the whole may be lifted with perfect security by the candle as well as by the candlestick. Should the socket be

too narrow, the lower end of the candle is to be held over another burning candle, and the part melted off allowed to drop into the socket as before, until sufficiently reduced in size, when it is to be set into the melted liquid as in the former case. Candles thus treated can be allowed to burn down completely in their sockets without involving any danger from burning paper or other material used as a wrapping.—15 *C*, XIV., 221.

RESTORING CRACKED PORCELAIN DISHES.

Porcelain dishes which have become cracked may, it is said, be rendered water-tight again by drying them completely in a warm place, after which a solution of water-glass is to be poured in and allowed to stand overnight, then pouring it off and allowing the adherent film to dry slowly.—5 *C*, 1871, II., 16.

PREPARATION OF WOODEN LABELS FOR PLANTS.

Wooden labels for plants to be inserted in the ground may, it is said, be preserved for an indefinite time by first dipping them into a solution of one part copper vitriol and twenty-four parts water, and subsequently immersing in lime-water or a solution of gypsum.—6 *C*, *July* 14, 282.

BORAX FOR EXTERMINATING COCKROACHES, ETC.

Among the many applications of borax recently made, one of the latest is in the extermination of cockroaches, which purpose it is said to answer very perfectly, although we are inclined to doubt it. Half a pound, finely pulverized and scattered about where these disagreeable pests frequent, will, it is said, clear an infested house so thoroughly that the appearance of one in a month is quite a novelty. It is not known upon what peculiar influence of the borax this depends; but we are assured that the facts are as stated. One advantage of this application is the harmless nature of the borax, so that there is no danger to the household from its being exposed. The use of borax in Europe for washing is well known, the addition of a large handful of borax, instead of soda, to ten gallons of water, being sufficient to save half the quantity of soap ordinarily required. For light fabrics and cambrics a moderate quantity is to be used; but for

crinolines, which require to be made stiff, a strengthened solution is necessary. Being a neutral salt, it does not affect the texture of linen in the slightest degree; and as it softens the hardest water, it is much used in washing generally. It is also said to be unsurpassed for cleaning the hair.—17 *A*, *April*, 1871, 55.

REMEDY FOR WHITE ANTS.

The ravages of the white ants in tropical countries are familiarly told of in works of travelers, and given as among the most remarkable curiosities of insect life; and much ingenuity has been expended in the attempt to eradicate or destroy them. It is said by a late writer that by scattering common salt around places frequented by them they will soon be made to disappear entirely.—3 *D*, *January*, 1871.

SOLUBLE GLASS FOR FLOORS.

Instead of the old-fashioned method of using wax for polishing floors, soluble glass is now employed to great advantage. For this purpose the floor is first well cleaned, and then the cracks filled up with a cement of water-glass and powdered chalk or gypsum; afterward a water-glass of sixty to sixty-five degrees, of the thickness of sirup, is applied by means of a stiff brush. Any desired color is to be imparted to the floor in a second coat of the water-glass, and additional coats are to be given until the requisite polish is obtained. A still higher finish may be given by pumicing off the last layer, and then putting on a coating of oil.—8 *C*, *April* 21, 127.

INSERTION OF SCREWS IN WOOD.

When screws are driven into soft wood, and subjected to considerable strain, they are very likely to work loose, and it is often difficult to make them hold. In such cases it is said that the use of glue is of service. A stick of about half the diameter of the screw to be used is to be first immersed in a thick glue, and then inserted in the hole prepared for the screw, which is then to be driven home as quickly as possible. When an article of furniture is to be hastily repaired, and no glue is at hand, insert the stick, fill the rest of the cavity with pulverized resin, then heat the screw sufficiently to melt the

resin as it is driven in. Chairs, tables, lounges, etc., are continually getting out of order in every house, and the proper time to repair them is when first noticed. The matter grows worse by neglect, and finally results in laying aside the article as worthless. If screws are driven into wood for a temporary purpose, they can be removed more easily if dipped in oil before being inserted.—3 *A*, *May* 27, 383.

TIGHTENING CURTAIN-CORD.

The following method is recommended for tightening the endless cord used in window-blinds: Let the pulley over which the cord passes be mounted on one arm of an L-shaped slide, the other arm passing inside a heliacal spring, the whole mounted in a slotted tubular case, which is to be fastened to the window-casing, or other place, so that the heliacal spring acts upon the pulley, to keep the endless cord at the tension necessary to act upon the curtain-roller, and the spring yields to any contraction or expansion of the cords under atmospheric changes. The arm of the pulley-slide, being within the spring, can not become obstructed in its movement in the tubular case.—*Student*, *February*, 1870, 107.

PROTECTING CORKS AGAINST ACIDS.

Corks may be protected from the action of acids by first soaking them for several hours in a mixture of one part concentrated water-glass and three parts water. The corks are then allowed to dry, and afterwards coated with a mixture of finely-powdered glass and water-glass. When this coating is dry, the corks are to be placed for a short time in a solution of chloride of calcium, from which they are removed at length and washed with water, and dried.—8 *C*, 1870, 15.

PREPARATION OF COURT-PLASTER.

Our readers may thank us for a method of preparing what is asserted to be an excellent quality of court-plaster, fully equal to that usually sold in the drug-stores. For this purpose, bruised isinglass is soaked twenty-four hours in a little warm water. Nearly all the water is then to be evaporated by a gentle heat, and the residue dissolved in a small quantity of proof spirits, and the whole strained through a piece of open linen. The strained mass should be stiffened jelly when

cool. A piece of silk is next to be stretched on a wooden frame, and fixed tight with tacks or otherwise. The jelly is then to be melted and applied to the silk thinly and evenly with a brush, and a second coating put on when the first is dry. When this is dry, the whole is to be covered with two or three coats of balsam of Peru, applied in the same manner. —6 *A*, *March* 5, 303.

IMPROVED BIRD-LIME.

By adding a concentrated solution of chloride of lime to a strong solution of common glue, a mixture will be produced which does not dry up, and can be easily dissolved by the addition of water. Thus prepared, it is recommended as a bird-lime, replacing advantageously the article usually made out of holly-bark or other substances.—9 *C*, *October*, 1870, 79.

IMPROVED PASTE FOR WALL-PAPER.

A new form of paste for attaching paper-hangings to walls, and one which, besides possessing the merit of cheapness, has the advantage of preventing the paper from separating or peeling off, is prepared by first softening 18 pounds of finely-powdered bole in water, and then draining off the surplus water from the mass. One and a quarter pounds of glue are next to be boiled into glue water, and the bole and two pounds of gypsum are then stirred in, and the whole mass forced through a sieve by means of a brush. This is afterwards diluted with water to the condition of a thin paste or dressing, when it is ready for use. This paste is not only much cheaper than the ordinary flour paste, but it has the advantage of adhering better to whitewashed surfaces, especially to walls that have been coated over several times, and from which the coating has not been carefully removed. In some cases it is advisable, when putting fine paper on old walls, to coat them by means of this paste with a ground paper, and to apply the paper-hanging itself to this with the ordinary paste.—9 *C*, *December*, 1869, 92.

IMPROVING THE QUALITY OF SOAP.

A patent has been taken out in England for the preparation of an improved quality of soap from the poorer yellow or brown kinds. For this purpose a solution of twenty-eight

pounds of hyposulphite of soda, in four gallons of water, is to be heated with two and a half hundred weight of raw soap. The product obtained is lighter in color than the common article, hard and firm, and of superior quality.—15 *C*, 1871, 256.

EAST INDIAN METHOD OF BLOWING A FIRE.

Mr. H. Schlagintweit, the celebrated traveler, tells of a peculiar way of blowing the fire in India. When, in damp weather in the mountains, there was a difficulty in starting a fire, his native attendants were in the habit of taking a bamboo cylinder of about one and a half or two inches in diameter, and a foot and a half long, and blowing into it, not directly, but from a distance of six inches. This caused a whirling motion of the air around the edge, and more air was carried to the fire than from a tube held close to the mouth. Our traveler always found this expedient successful, and believes that the application of a similar tube might essentially increase the efficiency of the common bellows.—8 *C*, 1871, XII., 96.

MODE OF REMOVING THE SKINS OF ANIMALS.

Among the latest novelties in industrial operations appears to be a method devised in South America for loosening the skin of dead cattle, by the insertion of a pipe at some point between the skin and carcass, through which air is forced. The distention produced by the air separates the entire skin in a very short time from the subjacent fat and flesh, so that the hide can be taken off, and the whole operation completed, according to our informant, in the space of one minute. It is not impossible that some such application as this may be employed to advantage by the taxidermist for the purpose of more readily removing the skin from mammals and birds. Some species, at least, would be susceptible of this treatment, although in others the adhesion would probably be too great to admit of it.—3 *A*, *April* 28, 1871, 291.

AIR-CUSHION FOR THE FEET IN RAILWAY TRAVEL.

A writer in the *Medical Times and Gazette* refers to the fatigue of the limbs produced after a long railway journey as due mainly to the trembling motion of the floor under the

feet, and states that, having suffered considerably from this cause, he was induced to try the experiment of using the well-known air-cushion as a footstool. This answered so well that he has never traveled without using one in this way, and has found the effect to be a remarkable improvement.—20 *A*, *September* 16, 1871, 362.

PRESERVATION OF MEAT BY BISULPHITE OF LIME.

A patent has lately been taken out by Messrs. Madelock and Bailey for a method of preserving meat by means of bisulphite of lime. For this purpose, one gallon of the solution of this salt, of the specific gravity of 1.05, is combined with one half pound of common salt and four gallons of water. This, it is asserted, will preserve meat perfectly well for months, or even years. If this statement be substantiated by experiment, it will furnish a means for utilizing an immense quantity of flesh that now goes to waste, as it seems from the statement that this meat, when cooked, is not appreciably different from that which is perfectly fresh, and is without any taste of chemical substances.—1 *A*, *March* 31, 1871. 153.

IMPORTANCE OF KILLING FRESHLY-CAPTURED FISH.

It has been remarked by travelers in Holland that the river and sea fish in that country are of remarkable excellence of taste, and apparently possess much firmer flesh than those of other regions. This, however, results simply from the fact that the fish are always killed at the moment they are taken from the water, while in most other countries they are allowed to die slowly; and with the great tenacity of life possessed by these animals, many hours, and even several days in some cases, elapse before actual death ensues. This calls to mind the anomaly which prevails between our treatment of fish and other animals. The attempt to offer for sale birds or beasts that have died by what might be called a natural death, or that have been killed by drowning, would very soon be met by the action of the police authorities; but what corresponds to precisely the same treatment in fishes is allowed to pass as a matter of course. A slight consideration of the circumstances will soon convince us of the impropriety of this practice, and that the quicker we are in causing

the death of fish, as well as other animals, the better for us. There is also some choice in the method of killing; this, in most cases, being by a violent blow on the head, or against the side of a boat, or by means of a stick. The practice in Holland, however, is to sever the spinal marrow and the arteries of the neck just back of the head, by which means death ensues immediately, and the blood is allowed to escape from the body.

The difference in the taste of fish killed and of those allowed to die is most marked in species of vigorous habits and containing much blood, such as, for instance, our own bluefish (*Temnodon saltator*). Many persons have been struck by the excellence of this fish, as served up at Nantucket or Edgartown, finding them so much superior to those which they have eaten in other localities. The practice of the fishermen in these waters is to cut the throat of the fish between the gills immediately after capturing them, thus allowing the blood to escape freely and in large quantity. Experience has shown that fish killed in this way, and bled, will retain their firmness and freshness very much longer than those allowed to die in the ordinary manner.—*Zeitschrift für Akklimatisation*, 1870, 94.

REMOVAL OF RUST SPOTS ON LINEN.

It is said that spots of rust on linen or cotton articles may be made to disappear by first dipping them in a boiling hot saturated solution of oxalic acid, and then sprinkling them with very fine tin filings.—5 *C*, xx., 160.

PREPARED CORN-COBS.

A very convenient kindling wood is made in France from corn-cobs by immersing them in a mixture of sixty parts of melted resin and forty parts of tar, after which they are taken out and allowed to dry. They are then subjected to a second operation, which consists in spreading them out on a metallic plate heated to 212° Fahrenheit. They are finally assorted according to size, and tied up in bundles. These are sold at the rate of three or four for a cent. The establishment in Paris for manufacturing them employs thirty workmen, and effects sales to the amount of $40,000 annually.—13 *C*, 1871, *November* 1, 1384.

K. MECHANICS AND ENGINEERING.

PRINCIPLE OF "LEAST ACTION IN NATURE."

In a course of lectures delivered before the Royal Institution of Great Britain by Rev. Samuel Haughton, of Dublin, he attempts to prove that in every arrangement of bone, muscle, joints, and parts of animals, the relations must be such as to produce a given result with the least possible expenditure of labor, and that this principle of " least action in nature" is a guiding one, and can be shown to exist not merely in the movements of the planetary and stellar bodies, but also, and illustrated as well, in all physical phenomena, as in those of an organic nature. As is well known to many of our readers, Professor Haughton is one of the highest authorities on specical and animal mechanics, and it is in this branch of research that he endeavors to prove the existence of the law in question.—20 *A*, *May* 27, 597.

FLETCHER'S RHYSIMETRE.

Mr. Fletcher communicates to the British Association an instrument which he calls the Rhysimetre, intended to indicate the velocity of flowing liquids, and measuring the speed of ships through the water. The principle resembles that of the anemometer of Mr. Fletcher, by which he is able to measure the speed of hot air, flame, and smoke. In both instruments the impact force of the current, and also its tendency to induce a current parallel with itself, are measured, and become indicators of the force and velocity of the stream. A modification of the apparatus is used in measuring the speed of ships, the indicator, in size and appearance resembling a barometer, being placed in the captain's cabin. The instrument can be made self-registering, marking on a sheet of paper the speed obtained at any instant of time. It is said that it has already been introduced on board some of the larger steamers plying between England and America, and has proved of great value, superseding entirely the crude process of " throwing the log," as it shows at any moment the exact speed of the ship.—18 *A*, *August* 18, 531.

RESTORING BURNED STEEL.

A simple method of restoring burned steel to a workable condition consists in immersing it in a preparation made by melting three parts of pure colophony in a crucible, and after it has become perfectly fluid, adding, with continued stirring, two parts of boiled linseed oil, care being taken to prevent the mixture catching fire, of which there is danger should the temperature be too high. A dark brown mass will ultimately be obtained of the consistency of sirup, which has the peculiarity that any piece of cast steel, however much burned, when immersed in it at a red heat, immediately recovers its original excellence; and should the operation be repeated several times successively, a quality of steel is obtained of a fineness much superior to that of its original condition. The tempering is best done at a dark red heat, in rain water.—15 *C*, 1870, 102.

THE HEATON AND BESSEMER PROCESSES.

A careful report by an eminent iron-master in France upon the respective merits of the Heaton and Bessemer processes of refining iron presents the conclusion that while the former is not likely to replace the latter for the manufacture of steel, yet it is the best hitherto invented for the purification of ordinary cast iron. It may be remembered that the Heaton process consists essentially in the addition of nitrate of soda to the melted metal, by which all the impurities, such as carbon, sulphur, phosphorus, etc., become chemically combined with the nitrate, and pass off with a loud deflagration in the form of vapor, leaving the metal in a state of extraordinary purity.—3 *A*, *March* 4, 1870, 165.

SIEMENS'S STEEL.

Among the various methods of preparing steel, that of Siemens, so well known in connection with an improvement of the smelting furnaces, is likely, it is said, to attain considerable prominence, possessing various advantages, both as to economy and the character of the product, over many others in common use. For its preparation, good hæmatite ore and spathic ore are mixed and treated with carbonaceous materials, by which their total or partial reduction into metallic

iron is effected. This metallic iron is then subjected to very intense heat on the open hearth of a Siemens regenerative gas-furnace, and is dropped in certain given quantities or series of instalments into a bath of cast-iron previously prepared in the furnace. This operation is continued until the requisite degree of decarbonization is arrived at; the manganese is added in the form of ore or spiegeleisen. The quantity of molten metal thus produced in one charge is about four tons. It is dipped into a ladle and poured into iron moulds in the usual way, and forms steel of the highest quality. To those acquainted with the ordinary way of making steel, the superiority of this process will be manifest, while as regards cost it effects a great saving. One ton of steel ingots may be produced with a ton and a half of cheap small coal. The ordinary Sheffield process requires from five to six tons of fuel for one ton of steel.—15 *A*, *April* 9, 1870, 488.

APPLICATION FOR PREVENTING OXIDATION OF IRON.

The following composition is used for preventing the oxidation of iron, especially the bottoms of iron ships: Seventy pounds of powdered sulphur, five pounds of the lye of caustic potash of thirty-five Beaumé, and one pound of copper filings are to be heated together until the sulphur and copper have completely dissolved. During the process, seven and a half hundred weight of tallow and one and a half hundred weight of turpentine are to be heated together in another vessel until the tallow has completely disappeared. The two solutions are then to be carefully stirred together when hot, and applied immediately with a brush.—5 *C*, XXVII., 216.

FORGING LARGE MASSES OF IRON.

A paper was read by Colonel Clay, at the Liverpool meeting of the British Association, in reference to the mode of overcoming the difficulties in the way of economical forging of large and solid masses of iron. Furnaces of the old style of construction were said to be most imperfect and unreliable, some of them requiring renewing once a fortnight. Mr. Siemens had introduced the principle of heating large forges by means of gas, which attained intense degrees of heat, and saved at least fifty per cent. in fuel, but it was not until recently that the principle had been applied to heating large,

solid masses of iron. This had lately been done, however, and proved completely successful. Reference was also made to improved facilities for handling hot masses of iron, and for affording more working space for the men; also to the construction of a hammer with a clear, unfettered fall.—5 *A*, *October*, 1870, 440.

PARKES'S IMPROVEMENT IN THE MANUFACTURE OF STEEL AND IRON.

Since the improvements made by Martin, Siemens, Bessemer, Heaton, and others in the methods of purification of iron and the manufacture of steel, much ingenuity has been expended in perfecting the various processes, and among others engaged in such experiments is Mr. Parkes, the discoverer of the substance known as Parkesine. This gentleman has just patented a process, the special object of which is to purify iron from sulphur and phosphorus, which is accomplished by injecting into it, when melted, compounds of chlorine or fluorine. By melting the wrought iron with carbon, together with some chlorides and alkalies, it is converted into steel. It is stated that the method is one that promises valuable results in its application to use on a large scale.—15 *A*, *March* 25, 374.

CAUSE OF THE RUSTING OF IRON.

It has usually been supposed that the rusting of iron depends principally upon moisture and oxygen. It would appear, however, from Dr. Calvert's experiments, that carbonic acid is the principal agent, and that without this the other agencies have very little effect. Iron does not rust at all in dry oxygen, and but little in moist oxygen, while it rusts very rapidly in a mixture of moist carbonic acid and oxygen. If a piece of bright iron be placed in water saturated with oxygen, it rusts very little; but if carbonic acid be present, oxidation goes on so fast that a dark precipitate is produced in a very short time. It is said that bright iron placed in a solution of caustic alkali does not rust at all. The inference to be derived is that by the exclusion of moist carbonic acid from contact with iron rust can be very readily prevented. —3 *A*, *February* 4, 1870, 94.

ROLLING RAILWAY AXLES.

A communication was recently made to the British Association upon a method for shaping railway axles by rolling pressure instead of by hammering, the result being accomplished in two minutes instead of half an hour, as required by the usual method, the axle at the same time being not only superior in quality, but more uniform in size, and of course capable of being produced more cheaply. The machine consists of three rollers, regulated so as gradually to press more closely together, thus reducing the diameter of the bar, and extending its length until shaped to the size required. Axles of any length can be rolled in this manner with collars at any part. The rollers are geared to revolve in all the same direction, their friction imparting motion to the axle. It was thought by the author of the communication that the rolling process would tend to obviate those flaws in axles which so frequently cause disasters on railways.—5 *A*, *October*, 1870, 441.

TESTING OF RAILWAY AXLES.

In view of the results of a recent accident in England, caused by the breaking of a railway car axle from the unsoundness of the material, by which eighteen persons lost their lives, Sir Joseph Whitworth, the eminent English mechanician, urges the great importance of the use of every possible means for detecting the unsoundness of the iron used in axles of railway carriages. As the best method for this purpose, he advises the drilling of a hole through the centre of its axis for its entire length, thus opening to inspection and examination that part of the material which, in the case of ordinary manufacture, is most subject to flaws. The hole should be about one inch in diameter, and with suitable mechanical arrangements might be drilled at an average cost of about thirty-seven cents per axle. With the outside turned and the inside thus exposed to view, a serious flaw in the axle, which is only about four and a half inches in diameter, could hardly escape discovery. This plan will also diminish the tendency of the axle to get heated, by removing the material near the neutral axis, and, under the circumstances, would reduce the internal strain, and thus render the axle safe.—3 *A*, *Aug.* 5, 103.

EFFECT OF COLD ON IRON AND STEEL.

For many years it has been almost an axiom among civil engineers that great cold tended to produce a brittle condition of iron and steel, and that by this hypothesis might be explained the alleged increase in the percentage of railway accidents by the breaking of tires and axles during the cold season as compared with the warm. A communication before the Literary and Philosophical Society of Manchester, by Mr. Brockbank, maintained the view just stated; but in the discussion which followed several eminent engineers entered their protest against it, and adduced facts which tend to an entirely opposite conclusion. According to Dr. Joule, numerous experiments by himself and others proved that, so far from iron and steel being weakened by cold, they are actually made positively stronger, resisting shocks and strains before which they yielded when brought to a higher temperature. While not denying the fact of the greater frequency of fractures during the cold weather, Dr. Joule refers these to the increased hardness of the ground by freezing, by which the iron is subjected to a greater strain or shock than under ordinary circumstances.—12 *A, January* 26, 253.

INFLUENCE OF COLD ON THE STRENGTH OF IRON.

We have referred to the experiments of Mr. Brockbank in regard to the influence of cold upon the elasticity and strength of iron, and to the theory of M. Joule and others that cold, instead of weakening iron, actually adds to its strength. Mr. Peter Spence has lately presented to the Philosophical Society of Manchester a further communication on this subject, in which he expresses his adhesion to the opinions of M. Joule, and has no hesitation in stating it as a law, that a specimen of cast-iron having at 70° Fahrenheit a given power of resistance to transverse strain, will, when reduced to the temperature of zero, have that power increased by three per cent. After the reading of this paper, Mr. James Garrick queried whether the results were legitimately deducible from the experiments mentioned by Mr. Spence, and thought that, for reasons adduced, the iron must have been of an inferior quality, and unfit for the purpose of reliable experiments. The impression, however, at the present time

is gaining ground that cold at least does not increase the tendency to fracture of iron, and that the greater amount of breakage is probably due, as previously suggested, to the diminished degree of elasticity of the road-bed, in consequence of the freezing of the soil.—1 *A*, *March* 17, 124.

ZINC ROOFING.

A great objection to the use of zinc as a covering for the roofs of houses, in spite of its cheapness, and the ease with which the sheets can be laid on, is found in the ready oxidation of the metal during wet weather, as well as in the unpleasant glare proceeding from it in the sunlight. Both of these defects may, however, be obviated by the application of a certain substance which gives to it a permanent slate color, and at the same time prevents decomposition. This is prepared by heating in a porcelain dish one part, by weight, of copper scales, with a mixture of three parts of hydrochloric acid, and one part of sulphuric acid, and continuing the operation until the red vapors cease to be evolved and the copper is dissolved. After this, sixty-four parts of water are to be added to the green solution, and the whole filtered.

The sheets of zinc to which the application is to be made are to be thoroughly cleaned, and then immersed for a few moments in this liquid. Afterward they are to be washed with water and allowed to dry in the open air. When dry they are to be dipped in a solution made by dissolving one part of black pitch and two parts of natural asphaltum in twelve parts of benzine or light coal-oil. After drying, a dull lustre may be imparted to the zinc by rubbing it with cotton or a cotton cloth.—16 *C*, III., 287.

METHOD OF WARMING RAILROAD CARS.

For the purpose of warming and ventilating railway carriages, it is proposed by Mr. Grandjean, of Paris, to use a reservoir of suitable capacity, divided into any number of compartments, in which are placed sponges saturated with the essence of petroleum, mineral essence, or any other carburet of hydrogen of a volatile nature. In the middle of these compartments spaces are left so as to introduce wicks, which should touch the bottom of the receptacle, the number of the same being as large or as limited as desired; the upper part

of the wicks enter burners placed at the top of the reservoir. When these burners are lighted they constitute a regular stove, by means of which the warming of the carriage is effected.—8 *A*, *October* 1, 193.

SINGLE-RAIL TRAMWAY IN INDIA.

A new form of single-rail tramway has lately been introduced in India with a satisfactory result. The vehicles used, in addition to the ordinary wheels, have a pair of flanged wheels, one behind the other, running on the single rail which is laid at the centre of the track. The flanged wheels are adjusted by a screw, so as to take all the weight off the ordinary wheels, without lifting them from the roadway. An experimental line has been laid, in part at an incline of 1 in 40, and along this a pair of bullocks draw a load of three tons. The advantages are, first, a very great diminution of power expended in hauling, as compared with traction on common roads; secondly, that the cost of construction is only one half that of an ordinary tramway with two lines of rails. —5 *A*, *October*, 1870, 431.

SIZE OF NARROW-GAUGE RAILWAYS.

The subject of the proper dimensions of narrow-gauge railways was fully discussed in the mechanical section of the British Association, and Mr. Fairlie, to whom the introduction of this important principle is largely due, presented a report, in which he concludes in favor of the 3-foot gauge rather than one of 3 feet 6 inches, as admitting the use of stock of ample size and of less weight. This will be about two thirds the size of the gauge heretofore generally in use, namely, 4 feet 8½ inches to 4 feet 10 inches.—15 *A*, *August* 12, 219.

EXTER RAILWAY BRAKE.

We find in a recent German journal an account of a new self-acting brake, invented by a German named Exter, which has been put in very successful and satisfactory operation on the Bavarian railroads. For the purpose of experiment, it has been applied to cars of different sizes, large and small, and on roads of a greater or less degree of inclination; and it has been found that, whatever be the rate of speed, a train can be stopped by means of these brakes in a very short dis-

tance. The steam of the locomotive can be shut off and the brake of the tender applied, and this acts immediately upon all the other brakes of the train. In cases where the locomotive was detached from the train and moved off from it, the same result was accomplished.—6 *C*, xxxvi., 282.

EXTER LOCOMOTIVE OR WAGON REGULATOR.

We have already referred to a steam brake invented by Exter, the general superintendent of railroads in Munich, and we now present a notice of a very simple arrangement lately devised by him for determining the velocity of locomotives, by which the engineer is in a condition to ascertain the rate at which he is moving at any moment, and to appreciate any variation, and thus be enabled to maintain any given rate of speed without the slightest difficulty.

Without figures for illustration it will be difficult to give a satisfactory account of the apparatus in question, which is contained in a small tin box immediately in front of the engineer, and is set in motion by means of a cord extending to the locomotive axis. This indicates, by means of a pointer upon a dial-plate, the rate of movement in miles per hour, and draws at the same time, by means of a lead-pencil upon a moving paper roll visible to the engineer, and receiving its rotation from the motion, a line corresponding to the velocity of movement at any point of the journey. The authorized rate of velocity for any given train is indicated upon this paper disk by means of a line, and any deviation from such rate is appreciable to the engineer, as well as to any other official. The sheets of paper are to be removed at the end of each trip, and held subject to the inspection of the superintendent of transportation. The apparatus thus furnishes a graphic representation of the exact rate of the speed of every train at any point in its path; and these indications being beyond the control of the engineer, an unerring check is held upon his movements, by which he can be brought to account for any improper dereliction of duty.

By a special adjustment of the apparatus, a second pencil shows how long the locomotive has remained at any given station, being set in motion while the engine is at a standstill, and ceasing when it is again started.

A somewhat similar arrangement has been made by the

same gentleman for measuring the rate of travel in carriages or wagons, indicating, as before, the time and rate of movement, and the stoppages made in the journey. This apparatus is contained in a small iron box fastened to the wagon, and provided with a glass door in front, through which the paper is visible. The advantages of the application of such an apparatus as a check upon the improper use of carriages by servants, or for determining the rate and distance traveled in a livery vehicle, will readily suggest themselves.—14 *C*, CXCIX., 152.

JACKET FOR STEAM BOILERS.

The practice of insulating steam boilers with a loose jacket of wood or tin, and filling in the cavity between the two surfaces with plaster of Paris, is now coming into use extensively, and with marked results. Independent of economy of fuel, the radiation of the heat is greatly reduced, and consequently applied more directly to the formation of steam, while there is much less inconvenience and annoyance to the fireman from the heat. When the gypsum has hardened, the exterior casing may be removed if it is considered expedient. Quite recently cork has been used for a somewhat similar purpose, especially for coating tubes for conducting hot air or water, and for locomotives.—6 *C*, *January* 20, 28.

REMOVING DEPOSITS IN STEAM BOILERS.

Every day adds to the number of methods recommended as efficient for removing deposits in steam boilers. One of the latest of these has been invented by Mr. Weiss, of Basle, and is called by him Litho-reactive, and is claimed to possess the property of extracting old deposits and preventing the formation of new ones, converting into soap the grease coming from the condenser, and finally neutralizing all the acids. The formula for the preparation is as follows: Five parts of molasses or beet sirup, fifteen parts of milk of lime, three parts of water, and eighty-four parts of soda-lye of thirty-four degrees Beaumé. The compound is said to precipitate at once all the bicarbonates, the sulphates, and the silica, to convert the grease into soap, and neutralize all the acids, removing all old deposits of whatever kind and however thick, and at the same time not attacking either iron or copper. It acts

not only at an elevated temperature, but precipitates and neutralizes in cold water all these foreign bodies. For this reason the water may be made to undergo a preliminary purification before passing into the boiler. Our space will not allow us to give the details of the chemical theory by which the different substances referred to play their parts in preventing or removing the deposits in question, although fully set forth in the original communication of Mr. Weiss. We may state, however, that two pounds of the preparation are said to be sufficient for eighteen hundred quarts of water.—1 *B*, *July* 4, 16.

PREVENTING THE SPONTANEOUS COMBUSTION OF COAL.

With the view of preventing, as much as possible, the chances of spontaneous combustion of coal on board ships, and in coal-bunkers on steam vessels, Dr. Lachmann recommends that coal as free as possible from iron pyrites be selected, and that the coal be loaded rapidly and in as dry a state as practicable. It should be stowed on board not too closely, and, as far as may be, all access of air and water is to be prevented. A sprinkling of coal-tar will, it is said, add to the security against spontaneous ignition.—1 *A*, *Nov.* 4, 225.

WEATHERING OF COAL.

An important communication has been made by Dr. Richters to a German journal upon the influence of atmospheric agencies on stone coal exposed to the air in coal-yards and other localities. In this memoir he states that the property which coal has of taking up oxygen when heated gently (as to 375° Fahr.) is modified essentially by its percentage of disposable hydrogen. This first of all becomes oxidized, together with a certain portion of the carbon, since, on the one hand, water is formed, and, on the other hand, the oxygen enters directly into combination with the coal. Also, that the carbon of stone coal possesses, at a temperature of about 375° Fahr., a variable affinity to oxygen, as the smaller portion (five or six per cent. of the total amount) combines with it and forms carbonic acid, while the rest, at the given temperature, shows little or no affinity for oxygen. While these two propositions respecting the oxidation of coal when heated can be established, our author adduces experiments to show

that they apply equally well at the ordinary atmospheric temperatures.

The so-called weathering of coal he ascribes to the absorption of oxygen, which in one case oxidizes a portion of the carbon and hydrogen of the coal, converting it into carbonic acid and water; in the other, entering directly into the composition of the coal.. If, then, the coal becomes heated in any way, a more or less energetic chemical action, varying in proportion to the elevation of the temperature, takes place upon the combustible substance of the coal; but, on the other hand, the process of oxidation proceeds so slowly that the changes occurring within the period of a year can scarcely be established with certainty, either technically or analytically.

Moisture, as such, seems to have no accelerating influence upon the weathering of coal, the positive effect being generally appreciable in coal containing a large amount of sulphuret of iron or pyrites, the decomposition of which is accelerated by the water.

Another proposition of our author is, that pure coal, heaped up for nine months or a year, unprotected from the weather and not allowed to become heated, is changed no more than it would have been in a perfectly dry locality. As long as any increase of temperature does not exceed certain bounds, as from 340° to 375° Fahr., there is no appreciable loss of weight by the weathering; and, in fact, there should be a slight increase, in consequence of the absorption of oxygen. The decrease in value for combustible purposes, and for other technical applications, which coal experiences by the weathering, is produced by a slight decrease of carbon and hydrogen, and an absolute increase of oxygen in consequence of the exposure.—3 *B*, *June* 9, 1870, 248.

CURING DAMPNESS IN WALLS.

A Russian preparation for curing moisture in the walls of houses consists in the use of a mixture made by adding two pounds of white resin to a boiling solution of three and three fourths pounds of green vitriol in one hundred pounds of water. To this, ten pounds of sifted red ochre (or other color), eight pounds of rye meal, and six and a half pounds of linseed oil are to be added, and the whole stirred together until it forms a completely homogeneous mass. Two coats of this

mixture are to be applied successively, while hot, but only in dry, warm weather.—5 *C*, VIII., 64.

PREVENTION OF MOISTURE IN TUNNELS.

By a system of tubes and pipes laid between the masonry of a subterranean tunnel and the mountain wall, and connecting with other drain-tubes leading to the exterior, an Austrian engineer has succeeded in rendering the tunnel completely dry.—6 *C*, *August* 11, 322.

COMBUSTION OF COAL-DUST.

An enormous amount of coal in the form of dust and small fragments is every year wasted in our coal mines, and, although many propositions have been made to utilize it by consolidating it into bricks, it has been found that the expense of this is greater than that attendant upon the extraction of large coal, and consequently the waste has still continued. It has been ascertained, however, that by taking fine coal-dust and placing it in a furnace, with the exact quantity of air which is requisite to effect the combustion of the coal, a mass of flame is obtained of the highest temperature, which does its work effectually, and emits no smoke whatever from the chimney. The results promised from this method of using fuel are so striking as almost to render it probable that, when dust can not be obtained, the coal itself will be reduced to powder for the purpose before being placed in the furnace.—15 *A*, *Jan.* 28, 117.

CONCRETE FOR BUILDING PURPOSES.

Such of our readers as are unacquainted with the value and importance of a new concrete, invented by a French engineer—M. Coignet—and bearing his name, will probably be surprised to learn that, at a comparatively small cost, works of the greatest magnitude are now made, as well as those possessing the utmost durability. An elaborate report on this subject has lately been printed by the State Department among its series of reports on the Paris Exposition of 1867, and, if no other service had been rendered in return for the expenditures made by the United States in connection with the Exposition, this one work alone would be more than an equivalent in bringing to our notice so important a material.

The process of preparing this concrete, or Bèton Coignet, consists simply in mixing a large quantity of sand with a small quantity of hydraulic lime, to which has been added a minute portion of Portland cement. This mixture, slightly moistened with water, is subjected to an energetic trituration, with compression, so as to produce a pasty or pulverulent powder. This pasty powder is then thrown in thin layers into moulds, where it is agglomerated vigorously by the blows of a hammer, causing it to set almost instantaneously. In less than eight days the concrete becomes so hard as to allow of the removing of the centering from arches twelve feet in diameter, a thing which could not be properly done in the same time with the best masonry.

This new concrete is now applied in France to a great variety of subjects—palaces, private residences, churches, archways, reservoirs, sewers, water-pipes, etc.—all capable of being formed out of a single piece; of the greatest solidity; of perfectly smooth exterior, and susceptible of embellishment with every variety of adornment; impervious to water; secure against the action of frost; and all at an expense very appreciably less than that of ordinary masonry.

Our space does not permit us to go into further detail on the subject, for which we would refer to the report in question, but simply to suggest that in this substance, requiring only sand in large quantities for its preparation, we may find the practical solution of the difficulties in engineering in many portions of the Southern States and elsewhere, where natural rock suitable for building purposes is not to be obtained except by transportation from great distances.—4 *B*, 1870, 25.

SOREL CEMENT.

According to the Quarterly Journal of Science, the sorel cement, which has attracted so much attention of late by its permanence and close imitation of various natural tones, is made by diluting or tempering magnesia, which may be more or less hydrated and carbonated, with a solution of chloride of magnesium in a dry state, and employing water to form the cement. The cement thus produced is especially white and hard, and may be used with advantage in place of some of the best cements. It possesses the same hardness, and will receive the same polish as marble, mosaic pavements, and

statuary. Imitation ivory can be made from it for forming billiard balls and other similar articles, medallions, buttons, etc. By combination with mineral colors the cement may be made to assume any desired tint, may be moulded like plaster, and be employed in the manufacture or imitation of innumerable objects of art and ornament. In practice the cement is never used in a pure form, but in combination with other materials, which, being incorporated with it while in the moist condition, are in the subsequent setting mechanically bound together into a solid mass. For this purpose the magnesia, in fine powder, is mixed with mineral substances, such as sand, gravel, dust, or chips from marble or other stones, or with emery, quartz, or other grits of various kinds, in varying proportions, according to the result desired. This mixture is then moistened with a solution of the chloride of magnesium, or with the bittern from salt-works. In some cases it is made sufficiently wet to form a mortar, and in others only enough to produce a state of dampness, like that of moulding sand. The mixture may be effected in troughs by hand labor, the material being worked over with shovels or hoes, or more expeditiously in mixing machines designed expressly for the purpose, and worked by horse or steam power.

The materials of which this cementing substance is composed are abundantly distributed over the surface of the globe. Magnesia sufficiently pure for the purpose is obtained by simply calcining mineral magnesite, large deposits of which are known to exist in Prussia, Greece, Canada, California, Pennsylvania, and Maryland. Deposits will doubtless be found in other places when the demand is made for the material. The chloride of magnesium is readily obtained by concentrating sea-water, the bittern of salt-works being sufficiently pure for the purpose. Sea-water concentrated to 30° B. precipitates nearly the whole of its chloride of sodium.—12 *A*, *July*, 1871, 412.

SCOTT'S SELENITIC MORTAR.

According to the London Mechanics' Magazine, a very important invention has lately been made by Colonel Scott, of the Royal Engineers, of a new kind of mortar, having the properties of setting very rapidly and becoming exceedingly hard on account of its great cohesiveness. This—termed se-

lenitic mortar by the colonel—is made by mixing a small portion of sulphate of lime or sulphuric acid with the water used, to which the lime is added, and the mixture ground to a thin paste in a mortar-mill. After having been ground four minutes, the remaining ingredients, which may be sand or burned clay, are introduced, and the whole ground together for ten minutes more. The sulphate of lime may be in the form of plaster of Paris (gypsum), or sulphuric acid alone may be employed. The best results, however, are obtained with the acid, and Colonel Scott therefore uses it in preference to the other substance, although this will answer effectually for all ordinary purposes. The secret of the extraordinary results obtained with this mortar lies simply in the fact that the acid prevents the lime from slacking, and thus enables it to take in twice as much sand as when slacked, its fieriness being controlled or brought into subjection. By Colonel Scott's process any lime can be made selenitic, and the more hydraulic it is the better are the results it gives. The great value of this invention consists not only in the extraordinary tenacity of the mortar thus obtained, but in its great resistance to pressure. Thus it is stated that a block of ordinary mortar, composed of one part of lime and two of sand, with a breaking area of two and a quarter square inches, usually breaks at seventy pounds' strain after being kept six months. With Colonel Scott's mortar, however, a block of the same dimensions, made of one part of Portland cement and four parts of sand, and kept for one hundred and sixty-seven days, required a strain of two hundred and six pounds for breakage. Again, mortar one hundred and sixty-six days old, made of one part gray lime, rendered selenitic, and three of sand, required two hundred and forty-five pounds for breakage, and another sample sustained a breaking force of two hundred and fifty-five pounds. This mortar has been applied with great advantage for imbedding tiles, which, as is well known, frequently break loose in consequence of their want of adhesion to the cement. In one experiment with the selenitic cement the joint was broken only after a pressure of one hundred and fifty-eight pounds, while with ordinary Portland cement fifty-eight pounds were sufficient to produce the separation.

The Mechanics' Magazine regards this as one of the great-

est inventions of the day, in having so many important applications, being used for concrete bricklayer's work, as stuff for plastering, mortar for pointing, stuccoing, etc. It is said that ceilings can be floated immediately after the application of the first coat, and set in forty-eight hours. Bricks can be made of one part lime to eight or ten parts burned clay or sand, pressed in a semi-dry state without burning, and ready for use in about ten days.—3 *A*, *July* 8, 5.

IMPROVED MORTAR.

According to a recent writer on the subject, it is stated that the disadvantages of the ordinary kinds of mortar at present in use arise chiefly from their being made of an inferior kind of sand, and the great difficulty of obtaining good sand at a moderate price. He therefore suggests an improved material, which requires no sand, and which only needs to be mixed with water. To prepare one ton of this mortar, two hundred and twenty-eight pounds of lime (either quicklime or slacked), seventeen hundred and twenty-eight pounds of slag, and two hundred and twenty-four pounds of calcined coal-shale clay are to be ground by machinery, and when brought to a powder, or a proper degree of fineness, are to be mixed with water, and the mortar will be ready for use.—9 *A*, 1870, 104.

VICTORIA STONE.

In a communication upon artificial stone made to the British Association by the Rev. Mr. Highton, the well-known fact was adverted to that certain forms of natural silica occurring in various parts of Europe, especially in England and Germany, can be dissolved, under proper precautions, even when cold. An important application has been made of this soluble silica in the preparation of an artificial stone, which is harder than any natural stone, except the hard granites and primitive rocks. The process indicated for utilizing this consists in first making a concrete of any good hydraulic cement. When this is dry it is steeped in an alkaline solution of silica, in which is placed a quantity of free silica. The following chemical process then takes place: the lime in the concrete extracts the silica from the solution, leaving the alkali free, which immediately attacks the free silica, and conveys it in

its turn to the concrete. This process goes on continually till the lime in the concrete is saturated with silica. In this way, within a week, the strength of the concrete is increased from fifty to one hundred and fifty per cent., and to a still greater degree by a longer immersion. As the alkali acts only as a carrier of the silica, it is used over and over again, and it is in this that the economy of the manufacture consists. The substance thus formed is known as silicated concrete, or the patent Victoria stone, and it has been manufactured on a grand scale in London, and several large edifices have been built entirely from it. The economy of its construction is such that it promises to supersede natural stone, except where the latter is very cheap and abundant. In London it can be put into place in building at a much less cost than natural stone.—1 *A*, *October* 21, 195.

APŒNITE, A NEW BUILDING MATERIAL.

A new building material, called apœnite, has lately been brought to notice as manufactured by the Patent Concrete Stone Company at East Greenwich, England. This, an artificial granite or marble, is concreted in a mould by the action of chloride of calcium and water-glass, combined with a body of Derbyshire spar or other material. It hardens quickly, and attains an ultimate crushing strength of three tons per square inch, equaling that of granite. It exhibits perfect sharpness and delicacy of moulding, besides admitting an exquisite degree of polish. It is also said to be unaffected by exposure to the weather or by acids, and to be produced at a less cost than scagliola or enameled slate. The same company manufactures a silicious paint, consisting of water-glass, or silicate of soda, combined with steatite, clay, or other incombustible element, and a coloring medium. This dries quickly, with a hard surface, and good, clear body color, and possessing extraordinary power of resistance to fire. In one experiment, the boarding and roofing of the wooden structures which were set on fire had been covered with the silicious paint, which was exposed to the full force of the flames twenty minutes, and, though the paint blistered and perished, it effectually preserved a large extent of wood-work from injury.—3 *A*, *July* 29, 69.

VICTORIA STONE.

A new artificial stone, known as Victoria stone, is now being manufactured in England by a process perfected by Mr. Highton. This consists in mixing broken granite, the refuse of granite quarries, with hydraulic cement, and steeping the mass in silicate of soda. For this purpose the concrete masses to be silicified are immersed in a tank of silicate of soda, in which are placed pieces of a peculiar silicious stone obtained at Farnham, possessing the property of having its silica in such a state as to dissolve in cold caustic soda. The lime of the concrete mass takes silica from the silicate, and the soda set free redissolves silica from the Farnham stone. Hence the process is continuous.—5 *A*, *July*, 1870, 317.

PORTLAND CEMENT.

According to recent extensive experiments, it appears that a sewer constructed of concrete composed of one part cement and six parts sand, and lined inside with cement, is the cheapest form of sewer, combining strength with soundness. The experiments also proved that the strength of Portland cement increases with its specific gravity, its more perfect pulverization, and its thorough admixture with the minimum quantity of water in forming mortar. Heavy and pure cement, weighing 123 pounds to the bushel, it is stated, will take about two years to attain its maximum of strength, and the admixture of sand or gravel reduces the strength of the concrete, which sets less rapidly than the pure article. Roman cement, though setting quickly, deteriorates in strength after exposure to air before use about twice as much as Portland cement.

HARD CEMENT.

A cement which becomes excessively hard in time may be prepared by mixing two parts of silica, one part of silicate of alumina, and nine or ten parts of carbonate of lime, all in powder, and then roasting in a puddling furnace. The remaining mass is then to be ground and again roasted with two or three parts of carbonate of baryta. In practice, very pure sand will answer for the silica and chalk for the carbonate of lime, the remaining ingredient being supplied by min-

eral witherite or natural carbonate of baryta.—5 *C*, XLVII., 1870, 380.

RENDERING WALLS WATER-TIGHT.

It is proposed by Mr. F. Ransome, of London, to render stone and brick walls water-proof by coating them to saturation with a solution of silicate of soda, which is superficially decomposed by the further application of chloride of calcium. The surface thus obtained consists of silicate of lime, which is perfectly insoluble, while it does not alter the appearance of the wall.—10 *C*, IV., 1871, 28.

ASPHALT FOR PAVING.

The subject of the best material for paving streets is, of course, one of great importance to all the larger towns and cities, and the favorite at this time in London seems to be asphalt. The London *Mechanics' Magazine* is inclined to believe that experiments now being made in London will have a satisfactory result, although it thinks that a heavy bed of concrete, of at least six inches or more in thickness, should be first laid in the more frequented streets of the city. Over this a thickness of two or three inches of asphalt is thought to be sufficient. For small towns both the layer of asphalt and of subjacent concrete may be considerably less in thickness—perhaps not more than half of that suggested.—3 *A*, *March* 24, 205.

UTILIZATION OF IRON SLAG.

The utilization of the slag of iron furnaces, which is produced in such immense quantity, has long been a problem, although of late years many attempts have been made to solve it. Methods have been suggested for extracting various substances of value in the arts; and in some countries, Belgium especially, the material is cast into moulds of a definite shape, and used, without farther preparation, for building purposes. All persons familiar with the iron districts where this substance is produced are aware of the excellent Macadamized roads it makes in the neighborhood of the iron furnaces; and it is now transported to considerable distances in England for a similar purpose. The best method of applying it is said to be by breaking it up into cubes of about

six inches, laying the roadway with them, and then covering the whole with fragments, broken to about two inches in size, to a depth of about four inches (making ten inches in all), after which the road is to be well watered, and crushed with a heavy roller. In this way an almost solid bed is made, which is entirely free from mud, almost so from dust, and of uncommon durability. Indeed, this method seems to have given so much satisfaction lately in England that preparations are being made to use it for paving certain portions of London, with the anticipation that it will answer much better than the asphaltum rock heretofore imported from France, and applied there to a similar purpose.—8 *A, March* 1, 50.

ARTIFICIAL PORPHYRY.

Messrs. Sepulchre and Ohresser have lately published an account of a method of treating furnace slag so as to obtain a kind of artificial porphyry scarcely inferior in durability or strength to the natural substance. For this purpose they dig furrows in the slag pit having the shape of an inverted truncated cone, and from twelve to fifteen feet wide, so as to receive the entire amount of slag produced in one or more furnaces at any one drawing off. The melted slag is to be emptied in this by means of suitable channels, and the cavity can be divided up by partitions, so as to cast the mass either in one continuous block, or in a number of blocks of any given shape. Care must be taken to have the slag run under the thickened glassy covering which forms at the beginning of the operation, the object of such a coating being to retain the heat; and it is even necessary sometimes to protect the mass against too rapid cooling by a covering of ashes, as this cooling should occupy several days, varying with the amount of the slag. When the operation is completed a dense homogeneous block or blocks will be found underneath this glassy covering of the character of natural porphyry, as stated.

This material has been tested by suitable methods, and has been found to bear a pressure of about 700 pounds to the cubic centimetre (a cube of about four tenths of an inch), while for complete crushing a pressure of about 1100 pounds was required. In other experiments with this artificial stone, fracture never occurred under a pressure of less than 600

pounds, and complete crushing only with a pressure of 1000 pounds, while some blocks resisted a pressure of 1300 or 1400 pounds.—18 *C*, xix., *May* 10, 303.

CEMENT FROM FURNACE SLAG.

Furnace slag can be made to furnish an excellent cement by selecting such portions of it as are readily dissolved in dilute hydrochloric acid. On subjecting it to the action of the acid silica is thrown down, which is afterward to be washed, dried, and pulverized. One part of this is next to be mixed with nine parts of powdered slag and the necessary quantity of slacked lime. This matter soon hardens, and rivals the best cement in its durability.—9 *C*, *January*, 1871, 3.

BLACKENING STONE.

A method of rendering stone completely black, to serve as a foil to some other color, or to protect it against the weather, consists in heating it in an oven to about 140°, and then removing it and dipping the side to be colored into a vessel filled with melted tar. After removal the surplus is allowed to drain off, and laid not far from the stove to dry. When it is half dried, it is placed in the air and allowed to become completely dry, after which a wisp of straw is used to rub off the blackened side, which gives to the stone a brilliant lustre, and prepares it for farther use.—9 *C*, *March*, 1870, 17.

PROTECTION OF STONE BY SALTS OF COPPER.

Dr. Robert, of Paris, recommends earnestly the use of salts of copper as the best preservative against the weathering of stone in a moist climate, and endeavors to prove that the wasting away of sandstone and granite is due to various causes, one of the most important of which is the development of a minute lichen (the *Lepra antiquitatis*). This plant is so destructive that the beautiful marble sculptures in the park at Versailles would be completely destroyed by it in the space of fifty years unless precautions were taken to arrest its ravages. Dr. Robert states that the amount of weathering away of rocks of all kinds, granite not excepted, is much greater than the public generally are aware of, especially when subjected to the influence of a moist atmosphere. Thus the obelisk of Luxor, which was brought to Paris from Egypt

forty years ago, has become completely bleached out, and full of small cracks, while for the previous forty centuries during which it stood in Egypt no change had been produced.—8 *C*, *June* 23, 199.

NATIVE HYDRATE OF SILICA.

An interesting mineral substance, capable of many important practical applications, found in the department of Ardennes, in France, has been brought to the attention of the Academy of Sciences in Paris. This is known in the country as gaize or dead stone, and lies at the base of the cretaceous formation, covering the clay of the Gault, and forming beds in some places of over one hundred yards in thickness. The material is soft and very light, of a specific gravity of only about one and a half, grayish in color, and has been found by analysis to contain more than one half its weight of gelatinous or hydrated silica, the remainder being composed of silicate of iron, alumina, potassa, and magnesia, as also some clay and fine quartzose sand. Many important industrial applications have already been made of this material, and others have been suggested. It can be cut readily with a knife or saw into thin plates or slabs of any desired size or shape, and can easily be fashioned into any pattern. Exposed to the air for a time it gradually becomes harder, and finally attains a condition of great durability, especially if subjected to a red heat, which increases its density to some extent without contracting the material very greatly, and makes it very suitable for the manufacture of crucibles, fire-brick, and other substances intended to resist the action of heat. It can also be used in the preparation of certain valuable cements and mortars, as also in making soluble glass. A somewhat similar mineral, found in large quantity in the south of France, called Bauxite, is likewise a hydrate of alumina, and is used largely as a refractory material. It is also worked in large quantity in the manufacture of aluminium, aluminate of soda, and pure sulphate of alumina.—6 *B*, *March* 21, 1870, 581.

KILLING WHALES BY CANNON.

The inventive genius of America has of late years been directed very largely toward improved modes of capturing fish, in which, not satisfied with the comparatively rude methods

of hooks and lines, spears, and even nets, an effort is made to destroy them in a much more wholesale manner. Even the whale fishery, which for so long a time has been carried on by means of the harpoon, has, as is well known, lately been prosecuted by firing explosive substances into the body of the animal with shoulder-guns or with cannon, and thus disabling it very quickly. This method has been adopted by many whalers in the Greenland seas, and has been especially applied of late to the taking of the large finback whales of the Norwegian coast. These animals have hitherto been but little disturbed by whalers, as, although of enormous size (from sixty to ninety feet), they possess comparatively little blubber, and are so active as to be rarely, if ever, successfully attacked by the harpoon.

A recent writer in *Land and Water* recounts a late visit to the establishment of Herr Foyen, in the Varangar Fiord, where, from a small island, the fishery is prosecuted by means of two small steamers of about seventy tons each. The special apparatus employed consists of a harpoon, inclosing in its head half a pound of gunpowder, and with jointed or hinged barbs containing some percussion powder between them. When the whale is within gunshot, this harpoon, attached to the end of a long cord coiled around a drum, is fired into the animal from a cannon about the size of a four-pounder. As the flukes penetrate the side of the whale they are naturally brought together or pressed down toward the shaft, and, in so doing, ignite the percussion powder, which sets fire to the gunpowder, causing an explosion in the body of the animal that usually produces a mortal wound. The whale, of course, starts off under the stimulus of the pain, and the rope is carried out for a time, being uncoiled from the drum precisely like a fishing-line from the reel of a fishing-rod, the steamer following after so as to prevent any undue strain. If necessary, a second discharge takes place, which almost invariably produces death.

The steamer then tows the animal back to the station, where the blubber is taken off in a long strip by means of properly constructed apparatus, after which the flesh is removed in a somewhat similar manner, and finally the bones are separated and hauled out. It is the intention of the proprietor to prepare a fertilizer by drying the flesh and redu-

cing it to powder, and a brisk trade has already sprung up in Germany in this article. The bones are likewise to be ground and utilized in various ways, so that the entire animal—blubber, flesh, and bones—will be put to economical purposes. The carcasses of over thirty whales were heaped up on the island at the time of the visit referred to, forming a red hill of very considerable magnitude, visible at a great distance. The proprietor stated that the factory would not answer its expectations unless fifty whales could be taken every summer. It was thought, however, that there would be comparatively little difficulty in securing this number; and, in fact, as we learn from later advices, over sixty in all were captured during the season.—2 *A*, *December* 24, 464.

A NEW GUNPOWDER.

Among the many practical applications of phenic or carbolic acid, not the least important is its use in the preparation of picric acid, a substance which, in combination with potash and other bases, promises to be of great value in the arts. Although readily produced from other substances, carbolic acid appears to be the most desirable source of supply, and only requires to be treated with concentrated nitric acid. A combination takes place with a hissing noise, and results in the formation of picric acid, in long lamellar crystals of a beautiful lustrous yellow color, and of an intensely bitter taste. Already used extensively in the preparation of dyes, it is as an explosive, of peculiarly valuable properties, that we now call the attention of our readers to it, as, when heated suddenly to the proper degree, it decomposes with explosion, and this peculiarity is increased when combined with an alkaline base. The picrate of potash is the most important in this respect, and has lately been the subject of extended experiment on the part of an eminent French chemist. This is a salt of a beautiful golden yellow color, crystallizing in prismatic needles, and, while insoluble in alcohol and nearly so in cold water, dissolves readily in fourteen parts of boiling water. Heated carefully, it acquires an orange-red color at 572° Fahr., which it loses on cooling; heated rapidly to 620° Fahr., or brought in contact with red-hot bodies, it explodes violently. It is most readily prepared by the double decomposition of a soluble picrate of soda, magnesia, or lime, and a

salt of potash, or by the direct action of picric acid upon the carbonate of potassa. The explosion of the picrate gives rise to an immense volume of gaseous matter, as nitrogen, carbon, hydrogen, and oxygen, and the only solid residuum is a little carbon and carbonate of potassa. The smoke produced is very light and easily dissipated, and the gaseous products are totally destitute of the corrosive and poisonous action of those of gunpowder, with their thick, heavy, stifling smoke. Nearly insoluble in cold water, there is no absorption of moisture from the atmosphere to deteriorate its quality or destroy its utility, as with gunpowder, so that it may be used in the dampest mines and other localities, where also the almost total absence of smoke and of noxious products after explosion is a great recommendation.

Two varieties of the picrate powder are now manufactured, one for blasting, the other for fire-arms, each made of various grades of strength and adapted for special applications. For the first purpose, nitrate of potash is used with the picrate; for the second, an additional ingredient, charcoal, is employed, the latter being added to diminish the rapidity of the combustion and increase the projectile force. This can be regulated so as to be greater or less than that of gunpowder, while the blasting power is much greater than that of the latter substance.

Our space will not permit us to go into more detail respecting this new powder, which is so easily made and kept unchanged, and can be made of any desired degree of strength, and in its explosion yields no deleterious or corrosive gases, blinding smoke, or acrid and troublesome residuum. It is nearly as cheap, and less easily ignited by carelessness or accident than gunpowder. Of much greater blasting power than gunpowder, and quite equal to nitro-glycerine in this respect, it seems destined to play a very important part in mining operations, while the comparative absence of solid deposit renders its use in gunnery highly advantageous. The color is a brilliant yellow, and thus it is easily distinguished among other substances. It is also of varied application in pyrotechnics.

In conclusion, we may state that the picric powder is the subject of extensive and secret experiment with the French government, which will probably use it before long as a sub-

stitute for the old-fashioned black gunpowder in its military and naval service.—4 *B*, *July* 15, 1869, p. 651.

DUALIN AND DYNAMITE.

In the course of a careful investigation on the part of a committee of engineers in regard to the comparative merits of dualin and dynamite (the two more recent blasting powders), it is stated that the former has advantages over ordinary gunpowder in cases where the blasting is to be done in soft stone or coal; but where the labor of boring is difficult, or where the gaining of time is of much importance, and where the blasting is carried on in very hard and solid rock, such as in most forms of tunneling, it is said that dynamite is to be preferred. Our readers probably will remember that dualin consists principally of nitrate of ammonia and very fine sawdust, which has been acted upon by nitro-sulphuric acid, and is said not to be decomposed by accidental contact with acids, and not to lose any of its properties in cold or heat. Its explosion does not produce any noxious gases, and it will burn in the open air without exploding. Dynamite, on the other hand, consists essentially of infusorial earth, prepared in a particular way with nitro-glycerine.—5 *C*, XXIV., 187.

DYNAMITE AND GUN-COTTON.

A recent comparison between the two best known and most readily used explosives, dynamite and compressed gun-cotton, gives the palm decidedly to the latter as much the safest and more manageable. It is stated that while a bullet fired at a box of dynamite exploded it at once, the gun-cotton was simply inflamed and burned in a steady manner; and that, while it is dangerous to apply a flame to dynamite, gun-cotton simply burns, occupying some time in doing so. It is well known that, to secure the highest explosive effect of gun-cotton, it is necessary to set it off by means of a percussion fuse or percussion cap, and that no other treatment will do more than to cause it to burn harmlessly.—12 *A*, *December* 29, 1870, 169.

DYNAMITE IN ARTESIAN-WELL BORING.

Dynamite, so extensively used for blasting in mines, tunnels, etc., has lately been applied in Denmark to a new pur-

pose of great utility, viz., as an aid in boring artesian wells. The owner of a large estate wanted water for his dairy, and commenced boring for it. For 80 to 90 feet no difficulty occurred, when a stratum of flint was struck, so unyielding that it appeared advisable to give up the enterprise; but, as a last resort, dynamite was tried with the best possible result. Two pounds of dynamite, in a flask provided with isolated conducting wires, were lowered down the well-cleaned boring to its bottom, upon the impenetrable flint, and then exploded. The percussion was barely perceptible at the surface of the ground, but the water in the bore was thrown up many yards. The bore, however, filled again immediately, and it became evident that not only the flint layer was pierced, but also that strata rich in water were opened, so as to render further boring unnecessary. Two more charges were exploded, and the flint at the bottom was found to be broken into fragments, while the tubing was entirely uninjured. The well now yields daily an ample supply of water. —14 *C*, CC., I., 47.

COMPARISON OF FORCE OF STEAM AND GUNPOWDER.

In comparing the power of steam and of gunpowder, it is said that the force exerted by the expanded gas in the explosion of a charge of powder, in a three hundred pound Woolwich gun, is equal, at some instant during the two hundredth part of a second, to nearly three million horse power. —12 *A*, *November* 10, 35.

EXPERIMENTS WITH COMPRESSED GUN-COTTON.

The remarkable experiments by Mr. Abel, of Woolwich, in regard to the effect produced by compressed gun-cotton, when simply laid on or pressed against the surface of bodies, and the various applications suggested of this new explosive agent, are doubtless familiar to our readers. A series of experiments has lately been made by the officers of the Royal Engineers, at Chatham, to determine more particularly the comparative effect of gun-cotton and gunpowder, and it was found that when two hundred pounds of gunpowder were laid against a double stockade of beams of timber fourteen inches square, three feet six inches apart, and sunk three feet in the earth, a large gap was made in the front stockade,

while the second was but little damaged, and would have sufficed to prevent the passage of an attacking party. Eighty pounds of gun-cotton were next treated in the same manner, and fired, as required, by a detonating fuse. In this case the explosion was terrific, and an almost perfectly clear breach was made through both rows of timber, making it practicable for an attacking party to go through. In another experiment four beams of timber about sixteen inches square were sunk in the ground, pressed together, and encircled successively by necklaces of disks of the compressed gun-cotton. These were exploded one after the other, and the beams were entirely cut in two. Other experiments of much interest were tried in the same connection, and all tended to prove the important applications of which the gun-cotton is capable.—3 *A, May* 20, 370.

TORPEDOES AS MEANS OF DEFENSE.

Experiments with torpedoes as a means of defense of harbors and coasts continue to be made, and it is now rendered extremely probable that in future they are destined to play a most important part in this connection. Elaborate investigations have lately been prosecuted by the military authorities of Great Britain, and the operators have succeeded in determining with great precision the distances at which the explosion of one torpedo is likely to disturb others set in the vicinity; and they have been able to arrange torpedoes so as to permit of their being exploded at the instant of time that an approaching vessel reaches a given spot, as shown by sighting it through two telescopes at a certain distance apart. —3 *A, October* 28, 307.

PALE YELLOW FOR SIGNALS.

It is stated, as the result of recent experiments, that pale yellow is to be preferred to all other colors for signal lights, as being the tint most quickly and readily recognized at a distance.—3 *B, August* 8, 739.

INDUSTRIAL NOVELTIES IN THE LONDON EXHIBITION OF 1871.

Some industrial novelties displayed in the London exhibition of 1871 attracted much interest.

Among the articles in the wool department upon which

mueh commendation is bestowed is an arrangement for washing sheep to eleanse the fleece. For this purpose the sheep is plaeed inside of a eage of water-pipes, perforated throughout, and eonneeted with a head of water, through whieh, on turning a coek, innumerable jets of water pass with eonsiderable foree, all playing from every direction upon the animal. The washing is mueh more thorough than could be done by hand labor, and the aid of the man usually required to hold the sheep is thereby saved. Another machine is intended for shearing the sheep, which it does in the most satisfaetory manner.

Among the miseellaneous articles of the museum, Admiral Inglefield's steering gear is mentioned with approbation, and it is stated that this has been applied to some of the larger iron-clad ships with great sueeess. In rough weather, from thirty to forty men are required at the tiller of these huge monsters, and even then the force of the waves will sometimes be too mueh for them. The gear in question utilizes the great hydrostatic pressure due to the twenty or thirty feet of water in whieh the ship swims, the water being allowed to eome into eylinders and to work pistons within them, much after the manner steam would do in an ordinary engine, and thus a motive power is seeured equal to one thousand pounds to the square inch, in small hydraulie rams attaehed to the tiller. A single man can by this method steer the largest ship in the roughest weather.

Another machine exhibited is a model by Mr. Tommasi for utilizing the tides as a souree of power for maehinery. This, however, is eonsidered rather curious than useful, as long as coal is held at any thing near its present priee. Some of the other artieles mentioned are Thompson's road-steamer, with India-rubber tires; Hodgson's wire tramway, with the saddles of the buekets elinging on to the wire rope by simple adhesion; Girdwood's eopper wire steam-packing, the eondensation of water within which forms the lubrieant; Siemens's eleetrieal pyrometer, for measuring the degrees of very high temperatures; Miehele's eement-testing maehine, in which the bent lever is most ingeniously applied; Captain Scott's selenitic eement; and other praetieal inventions worthy of elose investigation and consideration.—5 *A*, *July*, 284.

EXPLOSIVE BALLOONS.

An interesting and amusing philosophical experiment may be made by filling the new-fashioned collodion balloons with a mixture of oxygen and hydrogen gases, and, after closing the mouth of the balloon tightly with a string, allowing it to rise into the atmosphere. A fuse of filter-paper, about an inch long and half an inch broad, is to be previously gummed to the side of the balloon, near the mouth, and allowed to dry. When ready to ascend, a drop of the so-called Greek fire, or of a solution of phosphorus in disulphide of carbon, is placed on the filter-paper, the thread cut, and the balloon left to itself. After rising for about half a minute, during which time a considerable ascent is accomplished, the fuse reaches the collodion, and ignites it with a violent explosion of the gases, and the whole completely disappears, leaving no trace behind. —1 *B*, *April* 17, 251, and 6 *A*, *April* 11, 773.

LITHOFRACTEUR FOR BURSTING GUNS.

An explosive substance—a modification of nitro-glycerine —known as *lithofracteur*, has been highly recommended for blasting. We learn that it has been put to a special use by the German army in destroying the iron guns in the Paris forts. For this purpose, about two pounds of the lithofracteur mass, of a pasty consistency, are inserted in the muzzle, and a layer of clay an inch or two thick smeared over it. Through this, and into the mass of the explosive, is thrust a detonating fuse, and after the explosion the end of the gun is found to be either broken off or cracked so as to unfit it for further use.—3 *A*, *March* 3, 159.

PERTUISET POWDER.

A new kind of powder, invented by Mr. Pertuiset, has recently excited much attention in consequence of its enormously explosive power when used to fill projectiles. In one instance a target was prepared by fastening two plates, one of four and a half inches, and the other of four and three fourths inches in thickness, to a backing of ten inches of wood, followed by an iron skin of one and a half inches, and with twelve inches of oak behind this. A gun of eight inches calibre was loaded, first, with a solid projectile, and fired at

the target, simply indenting its face. A shell filled with the powder was then fired, and not only broke the iron plate and damaged the backing, but dislodged a mass of iron twenty-two inches by fifteen. A second shot struck on the sound plate, and, besides destroying the iron, so smashed the backing as to render the target unfit for further experiments. In another experiment a small explosive bullet was fired from an Adams 6-ounce pocket revolver at the forehead of an old horse. A small gray smoke was seen to escape from the wound, and the animal fell completely dead. On examining the wound, it was found that the skull was split, a large piece of bone detached, and the brain behind completely destroyed, being only a mass of gray and white matter devoid of consistency. When the loose matter was removed, a hole was left seven inches long by six inches broad.—12 *A*, *August* 11, 302.

PRESERVATION OF WOOD BY SALT.

Recent experiments, it is announced, prove that wood thoroughly impregnated with a strong solution of common salt resists decay, and answers well for underground work in mines and coal-pits.—15 *A*, *December* 9, 1871, 760.

EXPLOSION OF GUN-COTTON AT STOWMARKET.

Much excitement has been produced in England by the explosion of gun-cotton at the well-known works of Prentice and Co., Stowmarket, resulting in the loss of nearly thirty lives and in a great destruction of property. The precise cause of the primary explosion was unknown; but a second explosion was produced in the attempt to rescue cartridges from the burning building by means of a stick. This was attempted, as appeared from the evidence, in consequence of a report recently made on the subject of gun-cotton by Professor Abel, of Woolwich, in which the public were assured that, unless exploded by a fulminate, gun-cotton was perfectly harmless, being like so much loose cotton when ignited without detonation. It is generally understood, indeed, that to obtain the full effect of gun-cotton it is necessary to fire it by means of a percussion-cap or fuse. It is, of course, impossible to state that no fulminate was present on the occasion of the Stowmarket explosion, but it is not at all probable;

and we must therefore conclude that, under certain circumstances at present not understood, gun-cotton is really explosive by simple ignition, and, as such, is to be handled with the utmost precaution.—3 *A*, *August* 19, 1871, 134.

CHARACTER OF SCOTT'S SELENITIC MORTAR.

We lately gave an account of the new selenitic mortar invented by Colonel Scott, of London, said to possess very great merit, and to have been introduced into use on a very large scale. A late paper by Schott upon this mortar discusses it in a very comprehensive manner; and, after an investigation of the proper proportion and the qualities of the material, he comes to the conclusion that a much greater range of proportions, and a much larger number of ingredients than those mentioned by the discoverer, will answer an equally good purpose, thereby making it quite feasible to prepare it where the substances first considered as essential are not to be found. —14 *C*, CCII., 52.

DINAS STONE, A NEW FIRE-PROOF MATERIAL.

In the experiences of the Chicago fire (and in other similar calamities) as to the insufficiency of ordinary fire-proofing materials, it may be well to call to mind the peculiar properties of a new artificial infusible stone lately invented in England, where it is known as Dinas stone, Flintshire stone, or quartz brick. Its applications have been more especially in the construction of steel furnaces, smelting furnaces, etc.; but it would seem particularly adapted, in consequence of its extreme infusibility, to the preparation of absolutely fire-proof safes and vaults. The Dinas stone proper is prepared from a sandstone found in the Neath Valley of Southern Wales, occurring partly as a rock and partly as a sand. The rock is of a light gray color, with transparent edges, having the fracture of crystallized quartz, and is prepared by crushing between cast-iron rollers to a coarse powder (with the exception of certain portions which are too hard to be thus treated), and then adding one part of lime and a suitable quantity of water, and introducing the mass into iron moulds, where it is pressed, by means of a stamp, upon an iron bed. After the stones have been dried by artificial heat, while still upon the iron bed, they are baked for seven days at an intense heat

in a cupola furnace, and allowed to cool for the same length of time.

The stone shows in its fracture coarse, irregular, grayish-white fragments of quartz, inclosed by a light brownish-yellow finer mass, and swells in the fire instead of contracting. Metallic oxides and strongly basic slags attack this quartz rock very rapidly; and, like quartz, it will not stand rapid changes of temperature. In storing away this material it is to be protected from wet.

Dr. Carl Bischof, of Wiesbaden, who has lately published an investigation into the nature and theory of the formation of this stone, remarks that for a rational and suitable manufacture there are three requirements: First, that the rock must be as pure as possible, and in its essential features be of about equal fusibility with pure quartz; second, that the baked stone should possess and maintain sufficient density and continuity, since if otherwise, even with greater infusibility, the germ would be implanted of destructibility in the fire; third, that the air-dried stone should already have enough compactness to be susceptible of handling almost as readily as if burned.—14 *C*, CCI., 339.

DRILLING TRIANGULAR HOLES FOR BLASTING.

A correspondent of the "English Mechanic" states that in the Cleveland district it is now usual, when boring for blasting purposes, to make the holes of a triangular section instead of circular, as in the conventional style, and to effect this the boring bar or jumper is partly turned on each side of its cutting alternately. No difficulty is experienced in boring the holes to this shape, and they are found more effective than round holes, the corners forming points at which the fracture of the material operated on appears to commence, the line of fracture usually forming a prolongation of the triangle. The holes averaged three feet six inches in depth, and are generally made in thirty or forty minutes. The powder charges vary from one to two pounds, according to circumstances.—18 *A*, *August* 25, 1871, 566.

SHIP CANAL ACROSS CAPE COD.

Among the numerous engineering projects of the present day, few promise to be of more importance in a commercial

point of view than the ship canal, eight miles in length, by which it is proposed to connect the head of Buzzard's Bay with Barnstable Bay, across Cape Cod. It is believed that when this is completed a very large proportion of the shipping that now follows round the outside of Cape Cod, encountering the perils of the Nantucket Shoals and other impediments to safe navigation, will make a direct course through Buzzard's Bay, and thereby, while greatly shortening the time necessary for the passage, will accomplish it at much less risk of loss or detention, as well as at a reduced rate of insurance.

The feasibility of this project has been demonstrated, it is said, by careful surveys of the approaches to the proposed canal, while the nature of the ground to be traversed is also favorable for the purpose. A company has been organized for the purpose in question, and it is expected that the canal can be excavated to a depth of twenty-seven feet, and of sufficient width, at an expense of about $7,000,000. A bill has just been introduced into Congress to provide for the construction, by the general government, of a breakwater and harbor of refuge off Barnstable Bay, at a cost not to exceed $2,000,000. The bill provides for the reimbursement to the government by the company of all the expense incurred should any failure occur in the completion of the canal itself.

In this connection we may also refer to the renewal of the project, proposed by Telford many years ago, for a ship canal across the counties of Devon and Somersetshire, England, to shorten the sea passage between the Bristol and English channels. The proposed canal is to be twenty-one feet deep, and fifty-nine miles long, and will cost about $17,000,000. The freights on this canal, when finished, will probably consist principally of coal.

SHIP CANAL ACROSS NEW JERSEY.

In the preceding article we give an account of a plan proposed for the excavation of a ship canal across Cape Cod, to connect Buzzard's Bay with Barnstable Bay. In the same connection we may remark that a project has been suggested, and is now being very energetically urged, for the establishment of a line of interior communication, at least for small vessels, such as yachts, steam-boats, schooners, etc., to extend from New York to Delaware Bay. An examination of the

map of New Jersey will show that the greater part of the coast is bordered by outer beaches, which cut off inlets between them and the main land, and that it is only necessary, according to a statement before us, to make a few sections of actual canal, besides widening and improving certain natural means of communication, to complete the line in question. Should the enterprise be accomplished, and the Cape Cod canal be likewise constructed, a vessel might start at Boston, and pass by an interior line all the way to Delaware Bay.

The entire route by the proposed line of interior communication from New York to Delaware Bay is said to be about one hundred and twenty-five miles, requiring the construction of only about fifteen or twenty miles of actual canal, together with about fifteen miles of dredging to various depths. One section of canal, five miles in length, would be between the head of Denny's Creek, on the north side of Delaware Bay, and the head of Cedar Swamp Creek, which empties into Tuckahoe River, near the Great Egg Harbor Bay, the entire distance across being about twenty miles, while that around the coast is about sixty. From the head of Barnegat Bay to Squam Inlet, and thence to navigable water near Long Branch, a second line of about fifteen miles would be required.

WOODEN WATER-PIPES.

The great cost of iron pipes for conducting water has induced an ingenious citizen of Rochester to invent a substitute made of wood, which, as is asserted, answers the purpose equally well, and at a much lower price. The method of preparation consists in winding thinly-cut wide strips of wood, made continuous by splicing at the ends, upon a long form of the size of pipe required, the form being so constructed as to be taken down when the proper number of layers has been applied, thus freeing the pipe from the form. Lateral strength is secured by laying the strips, or laminæ, spirally in opposite directions. The laminæ are passed, before going on the form, through boiling-hot asphaltum, by which the whole is compacted together, and effectually protected from the destructive action of the elements. The pipe is exceedingly strong, as has been shown by repeated tests, having resisted a cold-water pressure of 275 pounds to the square inch.

L. TECHNOLOGY.

IMPROVED LOOM.

According to the Scientific Review, a new invention and improvement in looms, recently patented by Messrs. Young & Thomason, of Radcliffe, is more particularly applicable to the apparatus of those looms in which the pattern to be woven is formed through the medium of the jacquard apparatus, or through that of endless tappets previously arranged upon a barrel or chain, or other equivalent, the disposition of the cards of the jacquard apparatus, or other previously arranged pattern tappet, being designed to act upon and place in position pendulum hooks, each of which is suspended from a vertical bar connecting the top and bottom jacks, giving motion to the healds; each hook having an independent action, and being actuated so as to rise and fall through the medium of rising and falling knives, one being placed behind and the other in front of the suspended pendulum hooks, the up and down motions of which, and also the motion transmitted to the upper levers for closing the jacks, being obtained by means of a grooved coin, receiving a second motion from the crank shaft. The hooks, when in their nominal position, and not acted upon by the pattern-cards or tappets, are forced outward by springs into a position directly over the rising knife actuating the jacks giving motion to the bottom shed; but, previously to the using of this knife, the traversing pattern-cards or tappets have been brought into position, and forced, according to the shed required, such of the suspended pendulum hooks out from their nominal position into a position that will admit of their being taken or carried down by the descending knife on the opposite side. The upward and downward motion of the two knives at this time acts upon their respective hooks, and gives, through the medium of the jacks, the necessary rise and fall to the healds for shedding, according to the pattern under manufacture, simultaneously with which the pattern-cards or tappets effect their change for the next shed, the suspended hooks being again brought into their nominal position, and the shed closed by means of

the top closing levers before mentioned acting upon the ends of the jacks.—8 *A*, *May* 1, 97.

WEAVING STOCKINGS WITH DOUBLE THREAD.

Great elasticity is required in hosiery fabrics woven upon the loom fully to replace hand-knitting. When, however, such fabrics are much stretched, they appear very loose, in consequence of the wide interstices appearing in the web. To remedy this defect, it has been proposed to take two or more finer threads, instead of a single coarser one, which, not being twisted, will lie side by side, and produce what is called *closed* goods, without impairing their elasticity. The finer threads substituted should be rather more than an equivalent for the coarser. The strength of the fabric is increased by the change, while the working of the loom with such doubled yarn is said to be very satisfactory.—6 *C*, 1871, XVI., 152.

SMITH'S UNIVERSAL LOOM.

At the Exposition of the Industrial Association of Lower Austria for 1870, Mr. J. Smith's so-called "universal loom" excited great interest, on account of its quick motion, easy application of water or steam power, etc., and a member of the Association was induced to test its efficiency. He took it to his factory in Vienna, spared neither time nor money in the trial, and reported essentially the following result: A great deal of labor and practical skill was required to bring the loom into working order. This was partially owing to a defect in the machine used (to which, indeed, the agent of the inventor had alluded); but, so complicated is its construction, that it is asserted there is no prospect that it can ever be used by the common weaver at his home. The mechanical skill of the experienced machinist, which is only available in the factory, will always be necessary to its proper working. The operation of the treadle is of special importance with this loom, and its working requires great judgment and tact, essentially facilitated, however, by the convenient application of friction rollers. One hundred shots per minute would be the utmost possible, even for a skilled workman. With greater speed the labor is too fatiguing, breakage too frequent, and the products not so nice and clean.

This single experiment was, however, thought insufficient to positively decide the value of such looms in factories. A report received by the Association from a manufacturer in Ladz (Russian Poland) agrees essentially with the above. It mentions, in addition, the poor workmanship—says that not a single part is well made—and doubts also whether the power of one man would ever be sufficient to move the loom continuously at the intended rate of 150 to 180 shots per minute.—5 *C*, 1871, 74.

APPARATUS FOR DRYING WOOLENS.

Experience has proved that, in drying wool and woolen fabrics, the proper regulation of the temperature is quite essential. To insure the greatest speed in drying without injury to the fibre, the temperature must not exceed 86° to 97° Fahrenheit, while the air charged with moisture must be promptly removed by suitable ventilation. With these principles in view, Havrez, of Verviers, constructed a drying apparatus which is said to be especially serviceable in drying establishments. It consists essentially of two chambers, with double bottoms, between which steam pipes are arranged. One of the chambers contains fresh goods, while in the other are such as have been already acted upon or partially dried. The steam, under proper regulation of its temperature, is then let on, and it passes from the chamber with the fresh goods to the other. The drying air, however, is at the same time driven in the opposite direction by the ventilator; it enters the chamber with the half-dried charge, and escapes through the chimney with the moisture it has taken up in the latter part of its course over the fresh goods. A change in the position of the valves reverses the current of steam, as well as that of air, when it becomes necessary, by refilling the chamber.—13 *C*, 1871, v., 330.

ADULTERATION OF ANILINE WITH COAL.

Dr. Reimann, of Berlin, has lately detected quite an ingenious adulteration of brown aniline, this consisting in the addition of pieces of charcoal or of brown coal (lignite), which, when thoroughly impregnated with the dye-stuff, are only detected with great difficulty. When the aniline is treated with hot alcohol and filtered, the coal, of course, remains on

the filter; but since all the common aniline colors leave a residuum, this is no safe test. The comparison of the intensity of a solution of aniline of acknowledged purity with that to be examined gives the best indication; and if the price of the compound be established only in proportion to its dyeing power, there will be but a small inducement for fraud.—14 *C*, 1871, vol. 194, v., 514.

PREPARATION OF CARMINE PURPLE.

The dye recently invented, and known as carmine purple, is obtained by the solution of uric acid in nitric acid, care being taken to prevent boiling over and too great an increase of temperature. The mixture should remain standing quietly for some days, after which a thick, pasty, or doughy substance is obtained, which is to be treated with warm water, filtered, and the residuum again treated with warm water. The filtered liquid possesses a reddish or yellowish color, resulting from the organic substances decomposed by the nitric acid. This liquid is now a mixture of alloxan, alloxantin, urea, paraban acid, dialuramid, and other products of uric acid. It is next to be evaporated in a large enameled iron vessel, but not heated to the boiling point, which would destroy the murexide produced.

After the liquid has been evaporated to a sirupy consistency, and has assumed a beautiful brownish-red or violet color, it is to be allowed to cool. The entire quantity of the liquid should never be evaporated at one time, nor heated to the boiling point.—26 *C*, XIII., 1871, 207.

SEPARATION OF INDIGOTINE.

Messrs. A. A. Aguiar and A. Bayer publish as new a simple process by which they obtain pure indigotine, or the dyeing principle of the indigo of commerce, using aniline as a solvent. Pulverized indigo and pure aniline are to be heated to boiling in a flask, when the organic base almost instantaneously dissolves the coloring matter, and becomes a deep blue liquid, very much like a concentrated solution of indigo in sulphuric acid. This is filtered, and the residue treated with aniline as long as coloring matter is dissolved. Most of the indigotine crystallizes in the cooling solution within a few hours, and the remaining liquid becomes black from the

foreign substances it retains. On redissolving these crystals, and removing all traces of aniline by means of alcohol, indigotine of the utmost purity will be obtained. The aniline here used is an organic basis produced by the decomposition of indigo by heat, or, better, by the simultaneous action of hydrate of potash and heat.—14 *C*, CC., I., 72.

IMPROVED TREATMENT OF INDIGO FOR DYEING.

Mr. J. de Werveirne, of Ghent, employs a composition for dyeing with indigo which, he says, essentially expedites the operation, can be used cold, and yields à greater amount of dye from the same quantity of indigo. This is prepared as follows: To each pound of indigo are to be added one pound of amorphous zinc powder, one pound of madder, 750 grains of protochloride of tin, and one pound of slacked lime; the resulting mass then to be completely dissolved in 112 gallons of cold water.—13 *C*, 1871, VI., 403.

COMPOSITION OF ULTRAMARINE.

Some discussion has arisen as to whether ultramarine is, on the whole, a chemical combination, and if so, in what condition of combination its sulphur exists. This problem has attracted the attention of many authors, and among others that of Professor Stein, who has lately published a memoir on the subject in Dingler's Polytechnic Journal. In this he states that a majority of authors look upon the sulphur combined with soda in ultramarine as mono-, di-, or penta-sulphuret. A few persons, among them himself at an earlier period, believed in the existence of hyposulphuric acids, together with the sulphide of sodium, and still fewer thought it probable that the sulphur was combined with aluminium. As the result of his more recent observations, Dr. Stein has come to the conclusion that in blue ultramarine the acid is sulphuric and not hyposulphuric, and that sulphide of aluminium alone exists, without any sulphuret of sodium. The sulphide of aluminium may exist in two modifications, one of which is an amorphous black powder, and the other is a connected colorless or yellowish mass of crystalline character. The former occurs at a low temperature, and can be readily transformed into the second modification by heating to the melting point.

The blue color of ultramarine, according to Dr. Stein, which,

indeed, alone constitutes its characteristic mark, is, theoretically considered, independent of its chemical composition, and is rather brought about by the optical relationships of the constituent particles. Practically, however, this chemical composition is of the utmost importance, as affecting the excellence of so beautiful and durable a color. Ultramarine, in fact, optically considered, consists of a white and brown mass, in which sulphide of aluminium is mingled in molecular distribution. Each molecule of this combination is found, we may say, inside of a molecule of clay, and at the same time surrounded by three simultaneously developed molecules of sodium, which combine with silica into a basic salt, and envelop the entire group.—14 *C*, c., 299.

EXTRACTION OF ANILINE DYES FROM FABRICS.

Among the problems connected with the art of dyeing, one of much importance is the best method of extracting aniline colors from cloths without injuring the fabric, especially those which it is desired to dye anew; and to solve this, Dr. Reimann, an eminent authority on these subjects, publishes a detailed paper in his Dyers' Journal.

For this end several methods present themselves, the first referred to being the use of chlorine, which, however, is only applicable to cotton, this agent, whether in the form of gas or of chloride of lime, being excluded when we have to deal with substances consisting principally or partially of wool. The simplest method of accomplishing the object in this instance consists in digesting the fabrics for a sufficient length of time in alcohol of 90 per cent., which usually completes the decolorization in a short space of time. The same alcohol can be used several times in succession, and can afterward be purified by rectification or redistillation, so as to involve but little loss. The work is best done in a well-covered copper kettle, which is to be set in boiling water. A little hydrochloric acid may be added if the articles are not too delicate, thereby increasing the solubility of the aniline colors.

Still a third method is based upon the fact that all the aniline colors pass into given uncolored combinations when brought into contact with hydrogen. Thus fuchsin red is almost immediately decolorized when hydrogen is developed in its solution—the same taking place with violet, blue, and

green. This principle has long been applied in the so-called etch printing, in which the aniline colors are extracted in particular parts of the pattern by means of the hydrogen. This is done by laying on a sheet of metallic zinc, with water and the proper sizing. Water consists of hydrogen and oxygen; the metallic zinc takes the oxygen from the water, and the hydrogen developed renders the aniline tints colorless. After this it is only necessary to rinse out the fabric in order to extract the colorless combination.

Again, by saturating the substance to be deprived of its aniline dye with a feeble acid, such as vinegar or much diluted hydrochloric acid, and sprinkling the whole with powdered zinc, the color will be removed, especially if the fabric be slightly heated. This process is, however, much too complicated; and instead of it, we can better use liquids which will give off hydrogen, and thus have a reducing influence. Such a liquid we find in the solution of chloride of tin, usually known as the salt of tin. This must be of the very best quality to be efficacious, and in external appearance should be of a white color, and composed of clear, dry, and tolerably transparent crystals. A solution of such a salt of tin should be placed in a stone vessel and diluted until it can not injure the fabric (about one to two degrees B. of strength), and some leaves of tin-foil placed at the bottom of the vessel. The fabrics, previously rendered perfectly free from dirt or grease, are to be placed in the solution and the vessel covered, the whole being then heated by immersion in boiling water.

As soon as the decolorization has been accomplished, the cloth is to be taken out and rinsed in clean water previously warmed. Generally a new fabric should be left in the hot solution from a quarter to half an hour, and the vessel then be set aside to cool, after which the color will be found to have vanished completely.

There still remain instances, however, in which even this efficient method does not entirely accomplish its object, and the last resort, which is absolutely certain and never-failing, is to the cyanide of potassium. This, however, is a deadly poison even in a very small quantity, and the utmost precaution must be adopted in using it. The operator must be certain that he has no sore or cut on the hand, as contact with the liquid in that case would be extremely dangerous, al-

though while the skin remains perfectly sound no evil effect will be produced by contact. A stone vessel is to be selected, in which a small quantity of cyanide of potassium is to be introduced, and hot water poured upon it, so as to make a solution of one half to one degree B. Care must be taken not to inhale any of the vapor of the solution. The whole is to be stirred well with a long and strong glass rod, and the operation must be conducted in the open air, so that no harm may result from the condensation of the vapor. The fabric in question, previously well cleaned, is now placed in the vessel, and pushed under the liquid with the glass rod, and the top of the vessel laid on.

It will be advisable to adopt some method to keep the solution warm, such as immersing the stone vessel in a wooden tub properly supplied with steam or hot water. Should the vessel crack and the liquid leak out, it would in this instance become diluted with the surrounding water, and thus be less dangerous. After a short time the lid should be removed by taking it off at the end of a long handle, allowing the vapors to pass off before the operator comes near. By means of the glass rod the cloth is to be lifted, and if not entirely white, is to be replaced and the process continued still longer. When finished, the cloth is to be transferred by means of the glass rod to a large vessel containing hot water, and stirred around for a time, then removed and rinsed off. The solution of the cyanide of potassium can be used several times without losing its power, especially if a solution of sulphate of iron be stirred in occasionally, producing a deposit of Berlin blue.

We give only an abstract of the article of Dr. Reimann, referring our reader to the original for further details. Throughout the whole paper injunctions are continually laid upon operators to avoid very carefully the inhaling of the fumes of the solution, or touching it in any way except through the intervention of the glass rod.—24 *C*, XXIV., 185; XXV., 194.

COMBINATIONS OF WOLFRAM OR TUNGSTEN.

It is well known that wolfram or tungsten at one time was considered as a great nuisance by the miner, and many ores containing otherwise valuable metals were abandoned in consequence of the supposed disadvantage of the combination. Lately, however, this metal has become of economical impor-

tance, and is now prepared, either separately or in its combinations, as a regular commercial product. The extensive and increasing use of tungstate of soda for rendering fabrics water-proof and for other purposes, is well known. Tungstate blue is now taking a high rank as a dye. This is equal in appearance to the finest Prussian blue, resists the action of acids, and may be heated to 350° Fahr. without injury. It has the great advantage over Prussian blue of being unaffected by sunlight, which develops the color, and, after the maximum of intensity has been obtained, renders it indestructible. The color is equally visible in daylight and in artificial light. The process of manufacture proposed consists in successively dissolving in a sufficient quantity of water ten parts of the tungstate of soda, eight parts of the photochloride of tin, five parts of yellow prussiate of potash, and one part of perchloride of iron. When these materials have been added to the mixture and well shaken, the deposit found is removed from the fluid, either by decanting or by filtering, and, when sufficiently drained, it is exposed, in thin layers on plates, to the action of the sun for several days.—8 *A*, *April* 1, 1870, 68.

ARSENIOUS ACID AND ALBUMEN.

The preservation of albumen for manufacturing purposes is a problem of much interest, in view of the great use of this substance in the arts, one method consisting in the addition of a slight amount of arsenious acid, or arsenite of soda. The use of the former is, however, sometimes inconvenient on account of the great insolubility, and that of the latter is occasionally objectionable on account of its alkaline action affecting the application of the albumen. For the purpose of obviating these objections, Paraf suggested the boiling of the arsenious acid with glycerine, in which it is quite soluble; after allowing the solution to cool, and to stand for twenty-four hours, a few drops may be added to the albumen. The same substance can be added to gum arabic, paste, and other substances, to prevent fermentation, putrefaction, and the development of fungi. It will, of course, be understood that arsenic in this preparation is highly poisonous, and its use with substances intended to be eaten is therefore out of the question.—24 *C*, XVIII., 142.

REMOVAL OF DRIED ALBUMEN FROM VESSELS.

According to Dr. Steinde, vessels in which albumen or albuminous mixtures have been kept can be best cleansed by a mixture of equal parts of a saturated solution of a double bichromate of potash and sulphuric acid. Even burnt albumen is so far destroyed in a short time by this mixture that the vessel can be cleaned very readily by means of warm water and a brush.—8 *C, June* 23, 1870, 200.

POTATO FLOUR.

Few persons in the United States are aware of the demand for farina, or potato flour, and of the almost unlimited extent of the market that can be found for this product, which is simply the dry, evaporated pulp of the ordinary potato, the whiter and more free from black specks the better. It is used for sizing and other manufacturing purposes, and with the aid of precipitation and acid is converted into starch. In Europe it meets a large and increasing demand, in its primitive state, as potato flour, and in Lancashire alone twenty thousand tons are annually sold, and as many more would be taken if put into the market. When calcined, it is used largely for silk-dressing and other purposes.

At this time the quotation for potato farina in Liverpool is a little over four cents a pound, while wheat flour is about two and one sixth cents a pound, so that the potato flour is worth nearly double that of the wheat at the present rate. Consignments to Liverpool are solicited by the brokers there, who promise to take all that can be furnished.—*N. Y. Shipping List, December* 14, 70.

PREPARATION OF ALIZARINE.

Messrs. Bronner & Gutzkow, of Frankfort, have proposed a mode of preparing alizarine which has been favorably received and introduced into several large chemical works in Germany. It consists essentially of three operations, as follows: Anthracen is obtained by the distillation of asphaltum with superheated steam; this is rectified by redistillation. Anthracen heated with double its weight of nitric acid, of 1.3 to 1.5 specific gravity, and washed, gives *anthrachinon*. This is dissolved in moderately warm sulphuric acid, and ni-

trate of protoxide of mercury added. The solution of this compound in an alkali is filtered, and precipitated by means of an acid. The precipitate contains variable quantities of alizarine and purpurine.—14 *C*, CXCIX., 1871, 332.

LACTARIN.

Lactarin is a substance which has been lately introduced as a substitute for albumen for manufacturing purposes, and it is said to have great advantages on the score of cheapness and convenience of preparation. It is essentially a form of caseine, rendered impure by a little fat and the salts of milk. For use, it is diluted with water, dissolved in ammonia, and then added to the coloring matter.—25 *C*, XXVII., *July* 16, 220.

PHENYL BROWN.

The new coloring matter, phenyl brown, seems to be an important addition to the resources of the dyer, since shades of great beauty and considerable variety can be obtained, especially those adapted to dyeing wool, and requiring no mordant. The colors also are genuine, and capable of gradation between pomegranate brown and roe brown, in all shades of the so-called Havana. The method of preparing this brown consists in adding to one part by weight of phenol, ten or twelve parts of the so-called nitro-sulphuric acid (a mixture of English sulphuric acid and nitric acid), introduced in small portions, and allowed to stand after each addition until the reaction has ceased. Heating of the mixture is to be carefully avoided, and the addition of the acid is to be stopped as soon as the red nitrous acid vapors have ceased to exhibit themselves. The product of this reaction is to be put into a considerable quantity of water, by which a brownish deposit is thrown down, which, when collected, washed, and dried, forms the phenyl brown. The washing is difficult if the removal of all the acid is to be accomplished, which, however, is not necessary for the objects of the dyer. This brown is but little soluble in cold water, and still less so in hot, but is quite soluble in ether, alcohol, or acetic acid, and still more so in a mixture of acetic and tartaric acid. It is also easily dissolved in the solutions of caustic alkalies and their carbonates. When heated, it melts to a black resinous mass.—15 *C*, 1870, 86.

SAFFRANIN.

An important addition to the resources of the art of dyeing has lately been made in the discovery, by a French chemist, of a method of preparing a substance from coal-tar which completely replaces safflower and safflower carmine (derived from *Carthamus tinctorius*), the price of which latter substances has been continually on the increase, in consequence of the demand and the limited supply. The new dye is called saffranin, and is furnished in the form of a thick paste, of a bronze lustre, completely soluble in warm water, and more resistant of chemical agencies than other aniline colors; in this respect showing quite a resemblance to the Perkins violet. Saffranin belongs to the substantive aniline dyes, and thus is a pigment coloring animal fibre directly.

The economy of its use may be understood by the fact that one pound will dye fifty pounds of cotton to a dark saffranin rose of a beautiful color and great brilliancy; and the same quantity will suffice for eight pounds of silk, being thus three times as potent as safflower carmine. Its effect upon wool is very similar to that of fuchsin, producing a beautiful rose color, superior to that of the fuchsin in brilliancy. For use it is simply necessary to dissolve it in boiling water, and then filter the solution. The liquid thus obtained can be applied directly in coloring silk, although cotton naturally requires a mordant. The fabrics dyed with this material can be dried in heated rooms, in this respect being very different from the safflower colors.—6 *C, February* 16, 1870, 66.

DYEING WITH SAFFRANIN.

The delicate, rose-colored tint furnished by safflower has always been greatly admired, but the material for its production is very expensive, difficult to keep unimpaired, and affording a color of little durability. One of the many aniline preparations lately discovered by a French chemist, and by him named "saffranin," is said to be at least equal in brightness to safflower, while far superior to it in all other respects. It is claimed that it is much less expensive, much more durable, and can be manipulated more easily than safflower. A bath of Marseilles soap, with a portion of the dye-stuff, suffices to give a rose-colored ground to the yarn, while another

bath containing a solution of salt of tin completes the process. To this second bath saffranin must be added in sufficient quantity to obtain the desired shade. Rinsing is not absolutely necessary, but may be done. The drying succeeds best with moderate heat.—14 *C*, CXCIX., 1871, 430.

AFRICAN RED.

A new coloring matter has been introduced into England, under the name of African red, which can be used instead of madder, and is quite inexpensive. It is not necessary to prepare the fabric with tin, and the color can be readily fixed by the ordinary methods. It can be used equally well for coloring cotton or silk.—14 *C*, CC., III., 245.

PRODUCTION OF BLUE BRONZE.

Mr. C. Conrady, of Nuremburg, obtains a brilliant and fast blue bronze color by directly dyeing the white bronze with aniline blue. He boils the white bronze color for several hours in a weak solution of alum, then washes and dries. Being thus prepared, the white bronze is stirred in a solution of aniline blue in alcohol until the desired shade is obtained. After being washed in warm water, it is mixed with some petroleum while still moist. The smell of the petroleum is lost by exposure to the air for a few days.—5 *C*, 1871, 88.

SOLVENT OF INDIGO.

According to the Journal of the Society of Arts, Venice turpentine or paraffine, heated to the boiling point, will dissolve indigo with the same blue color as a solution of sulphuric acid; in petroleum indigo forms a carmine solution, while in spermaceti it produces a carmine violet, and in stearic acid a blue color.—18 *A*, *August* 19, 247.

BLUE DYE FROM MOLYBDENUM.

According to late experiments by Professor Böttger, based upon some previous researches of Dr. Schönn, if molybdic acid be dissolved to saturation in concentrated sulphuric acid with heat, an uncolored clear fluid is obtained, forming a double acid of sulphuric and molybdic acid. If a little of this double acid be placed in a porcelain dish and heated till it begins to throw off white vapors, and then a certain quan-

tity of absolute alcohol be gradually added, a beautiful blue color is developed, as if by magic, by means of which silk can be dyed without the use of any mordant.—8 *C*, XXVII., *July* 6, 215.

NEW COLORING MATTERS.

Professor Baeyer has lately brought to the notice of the Chemical Society of Berlin a new class of coloring matters. Thus, if pyrogallic acid be melted with naphthalic acid and some other substances, a new coloring material is obtained, named by him gallein, which appears in the form of either a brownish-red powder, or of small metallic green crystals. If this be boiled with a good deal of water, with addition of zinc and dilute sulphuric acid, the dark color of the liquid is transformed, after a certain time, into a light reddish-yellow. Some resinous matter will be separated from this by filtering, and the liquid becomes clear, but, on cooling, is clouded again by the separation of some oil-drops, which, after a time, become crystallized. Ultimately large brownish-red crystals are obtained, which consist of gallin mixed with a little gallein.

If gallin be heated with twenty parts of concentrated sulphuric acid to 200° C., the reddish-brown color of the solution changes after a time to a greenish-brown. After the reaction is completed, the mass is to be boiled in a large amount of water, and the very voluminous deposit washed with hot water. This consists of cœrulein, a substance readily soluble in hot aniline, with the production of a beautiful indigo-blue color. Other substances referred to in Professor Baeyer's paper are cœrulin, reforcin, fluorescein, etc., the latter of which will impart a beautiful yellow color to silk and wool without any mordant.

Attention is called to the similarity of gallein, gallin, cœrulein, and cœrulin to the coloring matter of wood. The relationship is particularly striking between gallein and the coloring matter of logwood, and between cœrulein and the lokao of the Chinese.—25 *C*, XXVII., *July* 16, 222.

MATERIAL FOR BLEACHING WOOL.

According to a patent lately taken out in Melbourne by Lande, one sixteenth part of soap and one part of cyanide of

potassium in eighteen parts of water constitute an excellent material for bleaching wool or cotton. When used it is to be diluted with fifty times its bulk of water.—6 *C*, *August* 10, xxxii., 318.

DYEING COTTON WITH ANILINE.

According to a Bavarian patent, aniline colors can be thoroughly fastened upon cotton fabrics in the following manner: A solution of 3 lbs. of sugar of lead in 24 lbs. of water is mixed with a solution of 3 lbs. of potash in the same quantity of water, to which is added another solution of 6 lbs. of alum in 40 lbs. of water, which serves as a mordant. The yarn, etc., is left for 12 hours in this solution, and then, having been well wrung, is placed for one hour in a bath of chloride of tin. When rinsed in pure water and wrung, it is ready for the dyeing proper, which is conducted in a cold bath, to which 3 oz. of aniline red, previously dissolved in 6 lbs. of strong alcohol, is added. The bath is then heated to boiling, which is continued for some minutes, when the goods are to be rinsed and dried.—5 *C*, xv., 120.

DYEING WOOD OF DIFFERENT SHADES OF ANILINE RED.

Mr. Stubenranch, of Fûrth, informs us that any woods naturally white, such as maple, linden, etc., can be easily dyed red, of varied and brilliant hues, by means of some of the aniline preparations, as corolin, rosein, etc. The wood is first soaked in or washed with Marseilles soap, after which a dilute alcoholic solution of the aniline color is applied, which may be repeated until the desired shade is produced. If the wood is impregnated with any pigment, it should be first bleached. For this purpose it is placed, for about half an hour, in a bath of chloride of lime and soda; a bath of dilute sulphurous acid may then be used to remove the chlorine. A thorough washing in pure water after this should precede the dyeing treatment.—5 *C*, 1871, 111.

DYEING RED ON WOOL.

For dyeing ponceau-red upon Caxton wool, the German Dyers' Gazette gives the following recipe: two pounds of powdered lac dye and one pound of powdered cochineal are mixed with eight ounces of bichloride of tin and hot water into

a soft mass and kept warm. After the lapse of several hours nine ounces of oxalic acid are to be added, and the whole composition is to be suspended for some time in a kettle of boiling water. It is then to be diluted with water according to the shade desired, in which about three per cent. of gum is dissolved, and the fabrics to be dyed immersed in it, and the whole, still thoroughly wet, are to be transferred into the steam box, where they are to be left for ten minutes to the action of the steam. The color becomes perfectly fastened, and rinsing removes the adhering gum, etc.—11 *C*, XI., 84.

MORDANT FOR FASTENING ANILINE COLORS IN COTTON YARN.

As a mordant for thoroughly fastening aniline dyes upon cotton yarn, Mr. H. Knal recommends a mixture of solutions of three pounds of sugar of lead in twenty-four pounds of hot water; three pounds of potash in the same quantity, and six pounds of alum in forty pounds of water. This liquid is to be diluted still more before being used. The yarn to be dyed (about 20 pounds) is allowed to remain in the solution twelve hours, and, after being thoroughly wrung out, is to be placed for one hour in a bath of chloride of tin. Rinsing in clear water, and wringing, finishes the preparatory operations. The process of dyeing is performed by placing the yarn in a cold bath, to which a solution of three ounces of aniline red in six pounds of alcohol of 96 per cent. is to be added. This is then slowly heated to boiling, and kept for several minutes at this temperature, when the yarn may be taken out, rinsed and dried.—13 *C*, 1871, v., 329.

ADULTERATION OF ANILINE COLORS WITH SUGAR.

Mr. Joly, of the University of Brussels, has ascertained that red aniline colors, such as fuchsin, rubin, etc., are frequently adulterated with great quantities of sugar, even to the amount of 50 per cent. On treating a sample of the suspected dyestuff with absolute alcohol, or, still better, with a mixture of alcohol and ether, the sugar will be left undissolved, and the amount of fraudulent mixture thus shown.—12 *C*, IV., 30.

ADULTERATION OF COCHINEAL.

There is a certain kind of cochineal in market which has a

very fine appearance, the single grains being well formed and plump, but having a grayish tinge from a white powder in the rings of the bodies. Baudimont found that such cochineal is adulterated with sulphate of baryta to the amount of twenty per cent. By shaking about fifteen grains of cochineal with sixty or seventy of ether, a deposit of baryta soon shows itself. The most remarkable effect of this adulteration, however, is that the product is specifically lighter than the genuine article, in spite of the heavy baryta. The *modus operandi* explains this seeming paradox. The cochineal is swelled by steaming, and afterwards rolled in precipitated baryta; it thereby absorbs about eleven per cent. of water, while the genuine contains only from four to six. Baudimont ascertained that this manipulation is publicly done by three London establishments, the article being sold under the name of *Cochenille plombée* or *chargée.* The consumer is therefore defrauded, since he pays the price of a genuine article, and obtains one compounded with water and baryta.—13 *C*, 1871, v., 330.

SIZE FOR COTTON YARN.

The following size is recommended by a German chemist as especially adapted for fine cotton chain yarns: One ounce of gum arabic is dissolved in three ounces of water by boiling, and two ounces of wax are added. This mixture is then well stirred, and, when cold, appears as a pale yellow paste, which is to be added, while hot, to a dressing made of five pounds of best wheat flour. This size makes the chain durable and smooth, and never cracks, even during the greatest heat of summer time.—5 *C*, XIX., 152.

A CHEAP AND LUSTROUS SIZING.

Mr. C. Puscher, of Nuremburg, recommends a special kind of sizing for finishing linen and cotton fabrics, and for other purposes, not only on account of its superior quality, but for its economy, as he thinks one third the ordinary expense can be saved. It is prepared as follows: Into six pounds of cold water one pound of the best quality of wheat flour is stirred, and when well mixed one ounce of aqua ammonia is added, while the mass is at the same time kept in motion. The flour swells considerably, and assumes a pale yellow color. Five

pounds of cold water are then added, and the whole heated and boiled together for a quarter of an hour, by which means the surplus of ammonia is expelled. The paste thus obtained is semi-transparent, and fit for use. It gives a fine gloss not only to woven fabrics, but to paper, etc. It is very serviceable for purposes of the laundry, since it stiffens well, and quickly produces the desired gloss. Part of the gluten is made soluble by the action of the ammonia, and thus the paste, when dry, is more pliable than that of pure starch; it is thus especially adapted to the use of book-binders, paper-box makers, etc.—6 *C*, 1871, 126.

USE OF RICE STARCH IN FINISHING.

It is said that many German manufacturers are greatly interested at the present time in the subject of rice starch. They have employed it to advantage in finishing goods, and consider it of great value on account of its entire freedom from sand, and as being without the injurious results sometimes attendant upon the use of wheat starch, from its becoming sticky. The only drawback seems to be the greater cost of the rice starch, although the effect produced by 100 lbs. is equal to that of 115 lbs. of wheat starch. Notwithstanding this difference, however, the rice starch is still preferred on account of its intrinsic value for some kinds of goods.—5 *C*, 1871, 112.

GRAEFE'S METHOD OF DYEING WITH PRUSSIAN BLUE.

A process of dyeing with Prussian blue, commonly called potash blue, suggested by Dr. G. A. Graefe, is considered a valuable improvement in the arts. In this a sufficient quantity of oxalate of ammonia is added to a solution of the nitrate or some other salt of iron, and when the prussiate of potash is added, any precipitate is to be immediately redissolved by stirring. The yarn or fabric to be colored is first soaked for some hours in this compound solution, and transferred without wringing into an acid bath containing some chloride of tin. The blue color immediately appears, and the subsequent treatment is the same as that in ordinary use. When fabrics have been impregnated with the above triple solution, and are printed with an acid mixture containing cloride of tin, the pattern appears blue upon white grounds

after washing. How the presence of the oxalate of ammonia prevents the decomposition of the iron salt by prussiate of potash is not definitely known; but a double salt of oxalate of iron oxide and ammonia probably forms, which is not acted upon by the prussiate of potash.—13 *C*, 1871, v., 329.

DYEING COTTON OF "NATURE'S COLOR."

Socks, and other fabrics of unbleached cotton, are commonly dyed with what is called nature's color, a reddish-yellow tint. The following process has recently been highly recommended as simple, cheap, and durable: Six parts of vesuvin and two of paladin (both aniline preparations) are to be boiled to solution in pure water, and filtered after becoming cool. A sufficient quantity of this to produce the desired color is added to pure water, with which the articles to be dyed must be thoroughly impregnated. No mordant is necessary, although a little alum may perhaps be added to the bath with advantage.—5 *C*, 1871, 88.

COLORING JAPANESE SILK.

Within the past few years much attention has been directed, both in Europe and America, towards the subject of rearing silk-worms of other species than that feeding upon the mulberry, which constitutes the source of supply for a greater part of the silk used in the European and American manufactories. The rapid increase in the number of diseases affecting the mulberry worm in various stages of egg, caterpillar, chrysalis, and perfect insect, has made it expedient to discover substitutes, and of all that have been presented to notice two seem to be favorites—the ailanthus worm and that of the oak, or the yamamai of the Japanese. Investigations have lately been made in regard to the chemical and mechanical peculiarities of the silk of the oak worm as compared with that of the common kind. In two specimens, one of the Italian and the other of yamamai train silk, prepared in the same establishment for dyeing in black by a mordant of iron, it was found that the former took 1.82, and the latter only .81 of the oxide of iron. Hence it would seem that the yamamai silk takes its mordant in an indifferent degree, and consequently is less adapted to receiving colors.

The other experiments, of a somewhat similar character,

were made in regard to the different degrees with which various colors were taken up after the same preparation; and, as a general result, it was ascertained that there was a great inferiority in this respect in the silk of the new worm, although it is possible that some treatment may be devised which will render the difference less palpable.—6 *C, April* 28, 1870, 156.

STAINING MARBLE YELLOW.

Inquiry was recently made by a technical society in Prussia for a treatment of white marble that would impart to it a permanent uniform yellow color, equal to that of antique marble, and one that could be made dark or light at will, penetrating at least one twelfth of an inch into the stone, but not affecting its chemical character. Of the several solutions offered, that of Professor Weber seems to have been most satisfactory, and is based upon the fact, hitherto not brought to practical application, that solutions of iron salts in strong alcohol are not decomposed by carbonate of lime, while, on the other hand, the aqueous solutions of the same salts are readily decomposed by the lime. Another important consideration is the fact that alcohol is more easily taken up by marble than water, and that the tendency to absorption may be increased very greatly by heating the marble to a certain temperature. If, then, the alcoholic solution referred to be applied to the dried marble, and this subsequently moistened with water, the oxide of iron that has penetrated the material of the stone is decomposed by the carbonate of lime, and is separated in the form of a finely divided oxide, not separable from the particles of marble.

In the practical application of the principles just enumerated, a neutral chloride of iron is to be first dissolved in ninety per cent. of alcohol, and after gently heating the marble to be colored in an oven or over a fire, the solution in question is to be applied by means of a brush, a sprinkler, or by some other similar apparatus, or even by pouring the solution over it. It will, of course, be understood that the strength of the solution is to be proportioned to the depth of the color desired; and care must be taken, also, in regard to the degree of temperature. For the production of light tints it is considered preferable to apply very diluted solutions repeatedly.

When the marble is perfectly dry it is to be moistened with water, or exposed to moist air, when the decomposition of the salt of iron referred to takes place in the upper strata, and the process of coloration is complete. The surface can then be polished, or, if already polished, it may be simply rubbed off with a wet cloth. No injurious effect upon the polish or hardness of the stone is produced by this operation.

Our space does not permit us to give other applications of this process, which can, it is said, be modified so as to produce various shades of color, and promises to be of great value in imparting to ordinary marble the appearance of certain rare and costly kinds.—6 *C*, *December* 15, 496.

TESTING THE PURITY OF COMMERCIAL INDIGO.

As is well known, commercial indigo frequently contains impurities, the percentage of which it is important to determine, these sometimes amounting to from twenty-five to sixty per cent., and consisting principally of indigo brown, indigo red, and indigo gluten, or gliadine. Of two methods applicable in the case, the first consists in extracting the foreign substance and leaving the pure indigo. For this purpose the article is treated successively with potash lye, acetic acid, and alcohol, the first extracting the indigo brown, the second the gliadine, and the third the indigo red. The residuum is then to be filtered, washed, dried, and weighed. The second method is simpler and quicker in its action, and is intended to determine the amount of impurities, which may be done by dissolving out the indigo by means of smoking sulphuric acid, which, however, takes up at the same time a little indigo brown and indigo red, and consequently rather too large a percentage of indigo blue will be indicated. As the difference is but slight, the inaccuracy is counterbalanced by the greater quickness of the process. The solution is to be made in twenty times the weight of sulphuric acid, with 2000 parts of water, filtered, dried, and weighed.—15 *C*, 1871, 1, 15.

FACILITATING DYEING WITH INDIGO.

The application of indigo in dyeing may, it is said, be greatly facilitated, and with a great increase in the coloring action of the indigo, by combining with each pound of the indigo a mixture consisting of amorphous zinc, a pound of

madder, and about twelve and a half drachms of proto-chloride of tin, to be dissolved in a vessel containing about 500 quarts of cold water and a pound of cold slacked lime.—8 *A*, *March* 1, 68.

BRONZING COPPER ARTICLES.

A method indicated for bronzing copper articles consists in first making the surface thoroughly clean and bright, and then covering it with a thick coating of rouge and water, and after drying it is to be placed for a short time in a hollow fire (as a chamber of bricks red hot) until the rouge has turned to the desired color. It is then to be placed in a suitable stand and polished with a soft brush and rouge powder, and afterward with soft leather.—8 *A*, 1870, *December*, 224.

IMPARTING A BLACK COLOR TO COPPER.

A beautiful black color may be imparted to copper by first cleaning it with sand and sulphuric acid, and then applying a liquid prepared by dissolving two parts of ordinary white arsenic in a mixture of four parts of hydrochloric acid, one of sulphuric acid, and twenty-four of water.—5 *C*, 45, 364.

SPECKLED FABRICS.

The manufacture of fabrics in which minute specks of one color are seen on a dark ground is becoming very common, this result being generally produced by the introduction of a silken thread. The same effect, however, is now accomplished, and in some cases much more readily, without weaving in the dots, by a different arrangement. The speckles themselves are applied by the help of a sprinkling apparatus, which divides the oil color very finely and sprinkles it over the cloth. The apparatus consists of a tin box, closed every where excepting on the front side. The oil color is placed upon the bottom of the box, and into this is immersed a small rotating, cylindrical brush, which lies parallel to the open side of the box, and can be turned by means of a crank. The bristles of the brush, in rotating, after being saturated with the oil color, strike against a small bar, and throw out the oil-color dust in very fine drops. On the back side of the box is a handle, by which it is held in the left hand, while the right turns the crank. In this way the dust-rain of any

desirable color can be directed over the cloth spread out on a table. If two colors are desired, it is only necessary to sprinkle the cloth first with one and then with the other. After the dye is sprinkled upon the surface of the cloths or fabrics, they should be folded face to face, and either passed between rollers or pressed by blocks, so as to drive in and further distribute the color on the cloths.—5 *C*, 1870, XL., 314, and 8 *A*, 1870, 225.

NEW BLEACHING PROCESS.

In a new bleaching process, the wool or silk, having been first cleaned in the usual way, is to be steeped for about an hour in a solution of equal parts, by weight, of oxalic acid and chloride of sodium in clear cold water, after which it is removed from the bath and allowed to drain, and then washed in the ordinary manner. The same bath may be used repeatedly by adding at each fresh charge of wool or silk a little more oxalic acid and chloride of sodium. The materials, while in the bath, should be stirred, and in the case of woven fabrics they should be passed through rollers. Should it be required to impart a blue color to the materials, the color employed should be first dissolved, filtered, and strained, and then introduced into the mordant bath, in proportion varying with the shade required.—8 *C*, *March* 17, 108; 14 *C*, CXIX., 174.

ELSNER'S ZINC GREEN.

According to a recent formula, Elsner's zinc green may be prepared by stirring up five parts, by weight, of the oxide of zinc and one part of dry sulphate of cobalt with a sufficient quantity of water, drying the paste and exposing it to a red heat, which, on cooling, is found to be a dark green powder. If ten parts of oxide of zinc and one part of sulphate of cobalt be used, the product is a grass green color, and with twenty parts of oxide of zinc the color is light grass green. The latter is most esteemed, because it is capable, under certain circumstances, of replacing the injurious Schweinfurt green, and because it fastens well upon lime, plastering, or whitewash, which is not the case with a green prepared from a mixture of Berlin blue and chrome yellow.—8 *C*, *June* 23, 199.

BLEACHING OF WOOD PULP.

According to Dr. Winkler, neither chlorine, bromine, nor any substance the activity of which is due to oxidation, will answer the purpose of bleaching wood pulp for paper making, the result being, in all cases, the production of a decidedly yellow, and sometimes even a brown tinge. Sulphurous acid was also found to be not entirely satisfactory, while the attempt at destruction of the natural coloring matters by means of fermentation proved to be of no practical value. There seems, therefore, to be room for the discovery of some additional mode of manipulation in order to effect the desired result.—16 *A*, *January*, 1870, 108.

FISCHER'S METHOD OF BLEACHING STRAW.

A method of bleaching straw, which is said to secure a result much superior to that of the ordinary processes, while not affecting the firmness of the material in the slightest degree, consists in placing the straw in question in tubs of white wood, and pouring hot water upon it, and allowing it to remain twenty-four hours, after which the water is to be poured off. The straw is then to be boiled for three hours in a copper vessel, in a lye prepared by adding one pound of soda to one quart of water, and from time to time replacing the water which escapes in steam without interrupting the boiling. The solution is then allowed to cool, and the straw again placed in the tub and covered with cold water, and, pouring this off after it has become of a yellow color, then fresh water is to be used in the same manner several times until the water seems clear. The straw is again to be boiled an hour in a solution half as strong as the original one, and then removed, and boiling water poured over it in a tub, which is allowed to cool, and cold water again poured upon it. This operation is to be repeated from time to time for three days; after this, the straw is to be covered with a solution of chloride of lime or chloride of sodium, the vessel closed, and left for twenty-four to thirty-six hours, or longer, until the straw appears completely bleached. The liquid need not be thrown away, but can be used for the earlier processes of the preparation of other quantities of straw. The straw thus prepared acquires a peculiar and rather persistent

smell, which can, however, be removed by placing the straw in water in which a little sulphate of soda has been dissolved, and then rinsing it off with fresh water.—15 *C*, 1870, 106.

CHINESE GOLD LACKER.

A German experimenter has lately discovered the method of producing the celebrated Chinese gold lacker, his imitations being entirely successful. His method of preparing this substance is to melt two parts of copal and one of shellac, so as to form a perfectly fluid mixture, and then add two parts of hot boiled oil. The vessel is then to be removed from the fire, and ten parts of oil of turpentine gradually added. To improve the color, an addition is made of a solution in turpentine of gum gutta for yellow, and dragons' blood for red. These are to be mixed in sufficient quantity to give the desired shade. The Chinese apparently use tin foil to form a ground, upon which the lacker varnish is laid.—3 *A*, *June* 17, 436.

GIVING A BLACK COLOR TO HORN.

A process recently announced for imparting a black color to horn, without the aid of heat, consists in taking the articles, finished and ready for polish, and immersing them in a lye of caustic potash or soda until the outer surface of the horn is somewhat dissolved, as shown by a greasy feel. With care, fine-tooth combs can be treated in this way without any injury. They are then washed off and dipped in aniline black, slowly dried, and then again washed off. By transmitted light the horn is of a dark brown color, but by reflected light it is of a deep black.—5 *C*, XVII., 136.

DYEING WOOL ANILINE BLUE.

The following method is recommended for dyeing aniline blue upon wool. The quantities given are sufficient for twenty yards. Three quarters of a pound of Marseilles soap are dissolved by boiling, and, when cold and sufficiently diluted with soft water, the goods are soaked in the liquid and well wrung. They are then placed in a bath of hot water acidulated with sulphuric acid, to which the coloring solution is added in accordance with the shade required. This solution consists of an ounce and a half of aniline blue in a pound and

a half of alcohol of ninety per cent. Rinsing, drying, pressing, and, when found suitable, sizing with a little glue, finish the process.—25 *C*, XIX., 153.

BARYTES WHITE.

Mr. Pfundheller informs us that the most beautiful white known to dyers may be obtained by the following method: For each hundred pounds of wool, three pounds of alum, one pound of cream of tartar, and two pounds of sulphuric acid are to be combined with one eighth of an ounce of soluble iodine violet, and the wool immersed in the solution at a temperature of 122° Fahr., and stirred round for an hour at this temperature. Another bath is to be made in the mean time, in a fresh kettle, with three pounds of chloride of barium, and the whole immersed in this, and kept at a temperature of 122° Fahr. for two hours. By this process the sulphate of barytes, the most beautiful of whites, will be thrown down in the fibre of the wool, which has been saturated in the first bath with the sulphuric acid, and it will gain about eighteen per cent. in weight.—23 *C*, XIII., 180.

SUBSTANCES FOR SIZING FABRICS.

In printing designs upon fabrics it is necessary to impart to the coloring matter a certain degree of consistency, in order that it shall occupy a particular space with sharply defined edges. Vegetable substances are specially adapted to this purpose, the principal consisting of starch, gum arabic, gum senegal, gum tragacanth, sugar, sirup, dextrine, etc. As some of these have a special chemical or mechanical reaction when used in connection with particular coloring matters, it becomes necessary to exercise a careful discrimination in their employment; and it is highly important that they be readily removable, after they have served the purpose of their application, by subsequent washing. Among the most generally applicable of all, however, are the substances usually known as leicom and dextrine, both prepared from starch, the former by the action of heat, and the latter by means of an acid. These are supplied in the form of powder, either white or dark colored, or as granular masses, and sometimes as solutions resembling a thick yellow sirup. For the preparation of the leicom (or leiacom, as it is sometimes called)

potato starch is to be spread out in pans of proper dimensions, and exposed to a temperature of about 400° Fahr., taking care to avoid burning, and kept heated until a slight change of color takes place; practically, as long as the mass remains white, some portion of the starch continues unchanged, which would prevent the preparation of a clear solution.

To prepare dextrine, one thousand parts of dry starch are to be moistened with a mixture of two parts of concentrated nitric acid and three hundred parts of water. The paste thus prepared is to be dried in pieces, first in the air, and then at a temperature of 140° to 150°, which is subsequently to be increased to 280°. This substance is considerably whiter than that obtained by heating, but in most cases contains a small portion of starch, which can easily be determined by reaction with iodide of potassium.

The above substances, in one combination or another, are used not only for purposes connected with printing, but also as sizes, and very largely in the preparation of the mucilage now to be found on every office table.—25 *C*, 1871, 177.

PREPARATION OF ALBUMEN FROM BLOOD.

The preparation, on a large scale, of albumen from blood is, we learn, carried on successfully at establishments in North Germany and Hungary, and it is furnished at one half the cost of egg albumen, although equal to it in all respects except color. It is said that three thousand pounds of blood will yield one hundred and ten pounds of albumen; and it is thought that, by proper care of the immense quantities of blood every day wasted, an ample supply can be furnished, which is not the case at the present time, compared with the extent to which albumen is required for refining sugar, sizing goods, etc.—15 *A*, *July* 29, 149.

DYEING WITH ACIDS IN BRASS KETTLES.

The substance of the vessel in which articles are to be dyed is of considerable importance, especially where acid solutions are employed. Brass kettles are most generally used for such operations; but scarlet, as well as some other dyes, in which acids are used, can not well be introduced into such a vessel. Reimann's *Journal of Dyeing* advises, in this case,

that half an ounce of quicksilver sublimate for every ten or fifteen pounds of wool to be dyed be first added to the solution of tin, and the whole well stirred up and then allowed to stand until the kettle becomes of a silvery-white color, after which the wool is to be introduced and the dyeing prosecuted in the usual manner. During the process the mercurial coating gradually becomes removed, and is subsequently to be renewed. The work is thus carried on in what is equivalent to a quicksilver kettle, since the brass is completely coated with a layer of this metal.—6 *C*, VI., 56.

BRONZING OBJECTS OF WOOD, ETC.

Objects of wood, stone-ware, and porcelain, picture-frames, etc., may, it is stated, be made to receive a beautiful bronze by applying, by means of a brush, a thin layer of a water-glass solution, and then dusting this over with fine bronze powder. The excess of the powder is to be removed by gentle tapping, and the article, if of porcelain or stone-ware, slightly heated. The bronzing may be polished by means of an agate stone, and thereby made to assume a beautiful effect.—5 *C*, XXVI., 216.

EMBOSSING WOOD.

In the increasing taste for ornamenting furniture and other articles with carvings of wood, many devices have been adopted for facilitating the work, and reproducing readily and with absolute accuracy many copies of certain patterns. The finest work is, of course, that executed by the hands of the accomplished artist, since proper play is allowed to his taste in modifying and varying the design, but the expense of such work is consequently very great. To attain a similar end in a cheaper manner, various mechanical devices have been employed, with more or less success; among others, the practice of heating iron or copper moulds, and branding the wood so as to obtain the general pattern, and afterward cleaning off the rough surface, has been used to a considerable extent. A German author calls attention to a hitherto but little used method of preparing carvings by means of pressure combined with heat and moisture, and is of the opinion that in time this is destined to replace almost all other modes. He gives three different variations in which this re-

sult is accomplished. In one instance the wood is pressed in the line of its fibre in cold or slightly warmed patterns until the desired relief is obtained. In the second method a metal pattern is pressed very powerfully against any surface, the projecting portions planed or rasped over, and the previously impressed portions brought up again by wetting them in water. Finally, as a third method, thin plates of wood are steamed or otherwise softened, and pressed between two corresponding dies. The second method our author considers of not much importance, since it requires a great deal of finishing off with the graver. The first is used to good advantage, but it is the third which he considers worthy of especial attention, since almost any form of wood can be prepared in this manner, and the effect is very superior. The operation should be performed with heated dies, not, however, brought to such a temperature as to burn the wood. A few drops of water placed on the dies causes a steam, which greatly facilitates the moulding of the wood. Resinous woods are not as serviceable as other kinds. Shavings of wood can also be used to advantage in these dies by glueing them together in successive layers, each one having its fibres running perpendicular to the next. In this way a mass is obtained of great tenacity, and capable of being used in places exposed to moisture, as in wainscoting.

The so-called casting in wood may be considered as a branch of the same art. This consists in taking wooden raspings, or fine saw-dust, especially from the pear-tree, linden, and mahogany, and mixing with some sort of cementing material, especially glue and tannin. These are pressed between the moulds just referred to, and are capable of a great variety of forms.—6 *C*, *August* 11, 319.

PRESERVING POLISHED METAL SURFACES.

According to Dr. Puscher, a very useful coating for preserving untarnished the surface of polished metallic objects can be made by placing an ounce of paraffine in a wide-mouthed and well-stoppered glass vial, and then adding three ounces of petroleum, after having melted the paraffine by dipping the vial in boiling water. The contents of the vial are then to be shaken up till the whole thickens into a kind of salve. The application of this salve to polished metallic sur-

faces, to be afterward wiped off, will preserve their lustre unchanged for a long time.—13 *C*, *May*, IX., 495.

BEST POWDER FOR POLISHING GLASS OR METAL.

According to *The London Engineer*, the best powder for polishing glass or metals is probably that used by Lord Ross in preparing the mirror of his great telescope. This is prepared by extracting the peroxide of iron from a solution of pure sulphate of iron by precipitating it by means of ammonia. The deposit is washed, pressed until almost dry, and then brought to a dull red heat, just visible in the dark. The only points of importance are in reference to the purity of the sulphate of iron, the use of ammonia in considerable excess, and the taking care not to allow the heat above that just indicated. The resulting powder should be a pale red, slightly tinged with yellow.—3 *B*, *August* 4, 608.

CUTTING GLASS AND STONE BY SAND BLAST.

At a meeting of the Massachusetts Institute of Technology, held on March 16th, 1871, an interesting paper was presented by Mr. James Hamblett, upon Tighlman's process for etching upon glass and cutting stone by a blast of sand. For this purpose the glass or stone is simply covered with paper, cut or perforated in the desired pattern, and then exposed to the sand blast, which cuts the material wherever the surface is entirely exposed in a very delicate and well-defined manner, the elasticity of the paper apparently preventing the action of the sand on the covered parts. We have not room for the details of the process by which the sand is directed against the glass, but there seems no doubt that the method promises an important revolution in decorative and constructive art. In eight seconds a pane of common window-glass can be ground or roughened, while ordinary sunk letters in marble, an inch and a half long, can be cut out in less than a minute.

Attention was called by Dr. Kneeland to the agency of a similar principle in nature, and reference made to the observations of Mr. Blake upon the action of the drifting sand on the granite at San Bernardino Pass, in California. According to Professor Wyman, glass windows on Cape Cod sometimes have holes worn in them by the drifting sands blown

by the winds. Similar agencies exist in Australia on a large scale, and specimens of hard rock cut into fantastic shapes are not unfrequently found in mineralogical collections.—*Boston Transcript.*

EFFECT OF HOT GLASS ON A CUTTING DIAMOND.

It is said that when diamonds are used in cutting hot glass in a glass factory, one will last for only one day, assuming a milky appearance; but that, if the glass be cold, one will last three months. Hot glass is cut, however, more readily than cold.—5 *A, October,* 1870, 440.

MIXTURE OF ALKALINE SALTS WITH PLASTER OF PARIS.

Persons occupied in making plaster casts have been for a long time aware that unburned gypsum can be made to harden by the use of an alkaline solution, and that if this be employed in connection with the burned gypsum, or the regular calcined plaster, a much firmer mass is produced. Some detailed experiments have lately been made by Mr. Schott, in Brunswick, which may furnish some important hints in regard to the use of sulphate of lime with potash. Thus, if equal parts of powdered crystallized sulphate of lime and of a neutral sulphate of potassa be mixed together, and then reduced to a paste with water, the mass hardens perfectly, and more quickly than gypsum in the ordinary treatment. If equal parts of common calcined plaster of Paris and of sulphate of potassa be mixed together, they will harden in a moment with less than an equivalent weight of water—so much so, indeed, that the mixture can not be poured out of the vessel. If, however, one part of each of the salts and two of water be used, they form a mass which can be poured out, and the surface of which will be found coated with a crust of sulphate of potash. The rapidity of hardening, therefore, can be made to vary with the percentage of water, the mass solidifying even if six parts of water be used.—6 *C, June* 23, 246.

IMPROVED METHOD OF TAKING PLASTER CASTS.

As some of our readers may be interested to know a method by which plaster casts of objects in natural history can be taken most conveniently, we present some instructions

lately published by Mr. W. Boyd Dawkins, an English naturalist of much eminence.

The best material for the mould in which casts are to be taken is said to be artists' modeling wax, a substance similar to that used by dentists. When softened and applied to any object it takes the most delicate markings with perfect exactness. The object whose figure is to be taken is first coated with a thin powder of steatite, or French chalk, which prevents the adhesion of the wax. After the wax has become softened, either by immersion in warm water, or from exposure to the direct heat of the fire, it is to be applied to the original, and carefully pressed into all the little cavities. The edges of the wax are then to be carefully trimmed all around, if the form of the object be such as to require the mould to be in one or more additional pieces in order to complete its contour. Powdered steatite is again to be used to prevent the several portions of the mould from adhering to each other, and the original is to be taken out of the mould before the latter becomes perfectly cold and rigid. After wetting the moulds to prevent bubbles of air lurking in the small interstices from appearing in the object, plaster is to be poured in; or, if the mould is in two pieces, it is generally better to fill each with the plaster separately, and then put them together. In this way the weight of the material will be reduced, and the cast itself will form a shell of a greater or less thickness.

The plaster casts are next to be dried, wholly or partially, and may be then painted of any desired color; or the color may be mixed with the plaster before it is introduced into the mould. After the cast is thoroughly dried it is to be steeped in paraffine, the ordinary candles answering this purpose very well. When the cast is cold it may be polished by hand with steatite, and the result will be found to be much superior to that ordinarily attained by the old-fashioned methods. It is stated that flint implements, fossils, bones, and teeth can be imitated in this way so that they can scarcely be distinguished from the originals.—18 *A*, *November*.25, 221.

METHOD OF RENDERING CRUCIBLES, ETC., INFUSIBLE.

In the increasing demand for infusible materials for the construction of furnaces, hearths, crucibles for melting glass

and steel, kilns for baking wares, etc., the idea has suggested itself of coating substances otherwise incapable of resisting heat with some composition that will impart to it the desired quality. According to the patent of M. Ponsard, of Paris, the articles in question, after having been made and dried, are covered with a highly concentrated solution of chloride of calcium, which penetrates the dry materials to a certain depth, and is perfectly refractory. This first layer is then dried in a stove, and coated with a layer of materials susceptible of being melted at a temperature approaching to that to which the pieces will be subsequently subjected. These materials are silica and clay, diluted with a solution of chloride of calcium, the proportion of which varies according to the temperature to which the articles made are to be exposed, and to the refractory quality which it is required to impart to them. These materials, on melting, form a gloss, the object of which is to cover the pieces with a continuous layer which protects the carbon from contact with the oxidizing gases.—8 *A*, *August*, 1870, 152.

DISTINGUISHING DEXTRINE FROM GUM ARABIC.

According to Dr. Hager, dextrine gum can be distinguished from gum arabic by its containing sugar. Gum arabic has a per centage of lime, which causes it to become turbid when mixed with oxalic acid—dextrine, on the contrary, remaining quite clear under the same treatment. Gum arabic, too, when added to a neutral salt or oxide of iron, throws down a deposit.—9 *C*, *January*, 1871, 5.

ENAMELED IRON SLATES.

An objection to the use of enameled iron for roofs consists, it is stated, in the unequal expansion, by heat, of the metal and the enamel coating, so that a fracture of the latter is produced. This difficulty Dr. Dingler has attempted to obviate by using a more elastic coating between the metal and the hard face.—8 *A*, *January*, 1871, 12.

GABBRO MASS.

A plastic mass, called Gabbro by its inventor, Dr. Schwartz, is composed of thirty-two parts steatite, thirteen parts of potter's clay, and three parts of soda. The steatite is first ground

with water, and afterward mixed with the other ingredients. In a half dry state this mixture may be turned in a lathe like wood, and is chiefly employed in making a kind of pottery ware. When used instead of wood, the mass can be colored with aniline, or other coloring matters.—1 *A*, *December* 30, 323.

CEMENT FOR UNITING METALS, ETC.

A strong cement, which hardens rapidly, may be made, according to Mr. Böttger, by stirring the finest whitening in a solution of silicate of soda, of 33° Beaumé, made so as to form a plastic mass. This can be readily colored to any desired shade. The addition of sifted sulphuret of antimony gives a black cement, which by polishing acquires a metallic lustre; iron filings render it grayish-black; zinc dust turns it green, but after polishing it appears like metallic zinc, and may be employed for the permanent repair of zinc ornaments, etc. Carbonate of copper imparts a light green color. Other additions may be made, as oxide of chrome for dark green, cobalt blue for blue, red lead for orange, vermilion for scarlet, carmine for violet, etc.—12 *C*, *Ob. Ge.*, IV., 30.

TUNGSTIC GLUE.

Tungstic glue bids fair to be an acceptable substitute for hard India-rubber, now so high in price. It is prepared by mixing a thick solution of glue with tungstate of soda and hydrocholoric acid, by means of which a compound of tungstic acid and glue is precipitated, which, at a temperature of 86° to 104° Fahrenheit, is sufficiently elastic to admit of being drawn out into very thin sheets. On cooling, this mass becomes solid and brittle, and on being heated is again soft and plastic. This new compound, it is said; can be used for all the purposes to which hard rubber is adapted.—8 *A*, *February* 1, 30.

NEW ENAMEL.

An excellent enamel, according to Duchemon, is prepared from a mixture of thirty parts, by weight, of saltpetre, ninety parts of silicic acid (fine sands or infusorial earth), and two hundred and fifty parts of litharge. Drawings can be made upon this enamel as upon paper, and the characters can be

burnt in by means of a muffle in less than a minute. This enamel, applied to a viscous glass, is recommended for plant-labels, guide-boards, numbers of houses, etc., and it can be employed in the preparation of photographs without the use of collodion. For this purpose a mixture of ten parts of gum, one part of honey, and three parts of bichromate of potash, properly filtered, is to be dried upon the enamel and then exposed in the camera, after which the image is developed by dusting over it a powder, consisting of ten parts, by weight, of the oxide of cobalt, ninety parts of finely pulverized iron scales, one hundred parts of red lead, and thirty parts of sand, and the chromate is decomposed by immersion in a slightly acidulated bath (one hundred parts of water and five of hydrochloric acid). After washing and drying, the enamel is to be melted by placing it upon a piece of sheet-iron carefully cleansed, and coated with chalk, for which a minute will suffice, and the photograph glazed upon the enamel is then brought to view.—6 *C*, *January* 27, 38.

WINDOW PUTTY.

An excellent window or glass putty may be made by boiling seven parts of linseed oil two or three hours with four parts of ground umber, and mixing four parts of yellow wax in the heated mass. The oil is then to be removed from the fire, and, while still warm, is to be kneaded up with five and a half parts of finely precipitated chalk and eleven parts of ground white lead.—5 *C*, XL., 320.

FASTENING RUBBER TO WOOD OR METAL.

The adhesion of sheets or plates of India-rubber to wood or metal can, it is said, be readily accomplished by the use of an ammoniacal solution of shellac. To prepare this substance, the bleached shellac is to be powdered and soaked in ten times its weight of purified aqua ammonia, when it swells to a slimy mass, and liquefies in the course of three or four weeks. This substance, when applied to wood or to iron, will, it is asserted, be found to answer the desired purpose. The ammoniacal solution softens the rubber, and in drying hardens with it, and on the surface of condensation forms a coating impenetrable to gases or liquids.—13 *C*, *August* 11, 1139.

PREPARATION OF TRAGACANTH.

It is said that gum tragacanth mucilage can be prepared much more quickly and of a more uniform consistency by first rubbing up the powdered gum with a little glycerine before the water is added. In this way the formation of lumps is entirely avoided.—*N. Zahrt. f. Phar.*, *September*, 1870, 164.

GILDERS' GLUE.

A very superior article of the so-called gilders' glue is obtained by cutting rabbit-skins into fine shreds, and boiling in water, then turning the mixture into a basket, through which the liquid passes, leaving the refuse behind. About fifteen hundred grains of sulphate of zinc and three hundred and seventy-five of alum are then to be separately dissolved in pure boiling water, and poured into the first-mentioned liquid, and the whole well stirred together while hot. The mixture is then to be passed through a sieve into a rectangular box, in which the jelly remains twenty-four hours in winter, or about forty-eight in summer. The mass, now having become solid, is to be separated from the box, and cut into slices of proper thickness, and laid upon nets to dry either in the open air or by means of some kind of artificial heat.—14 *C*, CXCIV., 516.

CEMENT FOR BOTTLE-CORKS.

An excellent material for sealing wine-bottles is said to consist of two parts of wax, four parts of colophony, and two parts of pitch.—15 *A*, 1870, 107.

PREPARATION OF GELATINE FROM BONE.

A new process of obtaining gelatine from bones, for the purpose of making glue, consists in exposing them to the action of benzine.—4 *B*, 1870, 24.

PRESERVATION OF PLASTER AGAINST VINEGAR FUMES.

Much difficulty is experienced in vinegar factories, and other establishments where acid fumes are disengaged, in preventing the plastering or whitewash from falling off. This may, however, be prevented, it is said, by washing the walls

with dilute sulphuric acid (one part to three of water). A thin layer of sulphate of lime is thus formed upon the wall, which is not attacked by the vinegar fumes at least, and consequently remains firm. Ordinary plastering, as is well known, contains carbonate of lime, which is gradually transformed into acetate of lime by the vapor of the vinegar, and as such scales off from time to time.—5 *C*, xxvi., 208.

WATER-PROOF GLUE.

A glue, which is said not to be affected by moisture, may be prepared by dissolving one ounce of sandarac and one ounce of mastic in half a pint of alcohol, and adding one ounce of white turpentine. A very thick glue is then to be made, to which some isinglass is to be added. The alcoholic solution is to be heated in a vessel to boiling, and poured gradually, with constant stirring, into the warmed glue, until the whole is intimately mixed together. The mixture is finally to be strained through a cloth, and is then ready for use, and is to be applied hot. It dries quickly, becomes very hard, and pieces of wood united with it do not separate in water. —15 *C*, 1870, 111.

PREVENTING MOULD IN MUCILAGE.

Solutions of gum arabic are very liable to become mouldy, and, while the introduction of creosote, corrosive sublimate, etc., frequently used to remedy this evil, is objectionable on account of the danger of poisoning, according to the *Industrie Blätter* sulphate of quinine is a complete protection against mould, a very small quantity of it being sufficient to prevent gum mucilage from spoiling. It is quite possible that writing-ink might be protected by the same application from a like difficulty. The use of ammonia for the same purpose is also recommended.—8 *C*, 1871, xvi., 127.

FASTENING PARCHMENT PAPERS.

The use of parchment paper has hitherto been extremely limited, for the want of a glue that would resist equally well both dry and moist heat. It is now stated that the Brothers Jacobsen, of Berlin, have succeeded in overcoming this difficulty by preparing a paste which has been found, on being subjected to a most severe test on an extensive scale, to meet

the required want. The supply of intestines soon being exhausted by the enormous quantity of pease-sausages manufactured for the German armies, the necessity arose for a substitute. This consisted of a tube of parchment paper glued together. Millions of these tubes from Dr. Jacobsen's factory were tested by the government, and found to answer the purpose admirably. They were even boiled for hours without either the glued seam or the paper itself being injured by the operation. The great value of this material having been thus shown, it will undoubtedly be found equally useful in many other important applications.—6 *C*, 1871, 125.

MORTAR FOR USE IN DAMP PLACES.

It is said that a mortar can be prepared, admirably adapted for plastering walls and roofs in moist localities, by mixing freshly slacked lime and sawdust made from very soft wood (rather fibrous than granular), and using only enough lime to permit the mass to attach itself to the wall without difficulty. These two ingredients combined, it is said, form a complete felting, which appears as if impregnated with lime, and so tough that a blow affects only the spot where it falls, without loosening the general mass.

This mortar is said to be especially adapted for plastering coffer-dam work, the inside of wells, cob-walls, etc. Applied in a layer of a quarter of an inch thick to the boards of an ice-house, against which the ice was densely packed, it was not affected in the least by the moisture. Rooms plastered with this mortar can, it is said, be papered in a few weeks.—8 *C*, *July* 14, 223.

GLYCERINE CEMENT.

It is said that the claims of a mixture of glycerine and lead litharge to form a fire-proof cement have not been substantiated, but that if gold litharge be substituted instead of that of lead, the desired result will be secured.—12 *C*, *June*, 46.

IRON-SLAG CEMENT.

A new form of cement, of much value, may, it is said, be prepared by finely pulverizing the slag of iron furnaces, and passing this through a fine sieve. This powder is then to be mixed in a mill with calcined gypsum, to which a variable

amount of soluble phosphate of lime has been previously added. The best proportion of the different ingredients is said to consist of 700 parts of gypsum and 300 of slag, to which, for use in the open air, 28 parts of soluble phosphate of lime are to be added. This, however, may be replaced by a corresponding quantity, 6 to 14 parts, of phosphoric or boracic acid, or any other substance capable of combination with the iron. The superphosphate of lime may also be substituted for the soluble phosphate. For this, however, an equal quantity of slag must be used. On the other hand, if the quantity of soluble phosphate of lime is increased, the sulphate may be entirely omitted.

It is alway necessary to have the different ingredients finely pulverized and well mixed. When used, a sufficient quantity of water is to be added, and the whole thoroughly stirred together. With these substances blocks can be made as hard as marble, and capable of imitating this substance very closely. For this purpose the necessary moulds are to be laid upon a porous bed—gypsum, for instance—and subjected, by means of a screw or hydraulic press, to a great pressure. The cement, thus compressed, is removed from the mould in the form of a very hard block, which takes as fine a polish as marble, and may be stained or colored previous to the pressure in such a way as closely to resemble the different colors of this rock. This artificial marble resists the influence of air, moisture, and frost, and is said to be well adapted for the fronts of houses, floor-tiles, etc.—12 *C*, xl., 318.

COMPOSITION FOR SHIPS' BOTTOMS.

A composition for coating ships and boats has been devised, which consists of paraffine mixed with metallic particles, or with a poisonous substance, such as arsenic, sulphate of copper, etc., or else combined with creosote dissolved in heavy oils. This is to be applied hot to the bottom of the vessel, and renewed from time to time as occasion requires. —17 *C*, 334, *July*.

EBONY FROM SEA-WEED.

It may interest some of our readers who reside near the sea-coast to learn that there is considerable commercial value in the common sea-weeds which are thrown up so abundant-

ly on the shores. In addition to their use as a manure, and for packing, large quantities are now converted into artificial ebony. The process consists in first treating the plants for two hours with dilute sulphuric acid, then drying and grinding them up. To sixty parts of this product, five parts of liquid glue, five parts of gutta-percha, and two and a half parts of India-rubber are to be added, the latter two being first dissolved in naphtha. Afterward ten parts of coal tar, five parts of pulverized sulphur, and five parts of pulverized resin are added, and the whole heated to about 300° Fahrenheit. When cool, a mass is obtained which, in color, hardness, and capacity for receiving a polish, resembles ebony, and is much cheaper. This material is now actually made on a large scale, and used for nearly all the purposes to which genuine ebony can be applied.—16 *C*, IV., II., 26.

ARTIFICIAL RUBBER.

It may not be known to some of our readers that the addition of tungstate to any protein body will give rise to an elastic, rubber-like mass. For this purpose, if we add tungstic acid or tungstate of soda, and then hydrochloric acid, to glue, a combination of the tungstic acid with the glue is produced, which, at the temperature of 70° to 100° Fahrenheit, is so elastic as to be capable of being rolled out into quite thin plates. The mass stiffens in cooling and becomes brittle, but can be easily rendered again plastic by heat. This material is now used to a considerable extent, instead of the more costly white of egg, for animalizing cotton, or rendering it similar to wool, and more susceptible to coloration by the aniline dyes. The same material is also used in tanning for the purpose of protecting the gelatinous tissues against decomposition. The leather treated with it is rendered very durable, although it becomes so hard as to limit its application mainly to shoe-soles. The same substance can also be used, under certain circumstances, as a valuable cement.—3 *B*, *February* 3, 225.

IMPROVED MANUFACTURE OF WHITE LEAD.

Messrs. Dale & Milner, of Lancashire, propose to manufacture white lead (carbonate of lead) by the action of the soluble acid carbonates of the alkalies on litharge, hydrated ox-

ides of lead, or insoluble basic salts of lead, in the two following ways: First, by mixing litharge, hydrated oxides of lead, or insoluble basic salts of lead, with an equivalent of bicarbonate of soda, together with sufficient water to form a stiffish paste. This mixture is to be ground in a suitable mill, small quantities of water being from time to time added, as may be found requisite, until the change of the lead bodies into carbonates is complete. The paste is to be well washed with water, and the supernatant liquid, which contains mono-carbonate of soda, is separated from the white lead by filtration, and is boiled down to dryness, and disposed of as soda ash, or it may be crystallized, or may be again converted into bicarbonate of soda by treatment with carbonic acid, and used to convert further quantities of lead oxides or insoluble basic salts of lead into carbonates. Instead of grinding the lead oxides or insoluble basic salts of lead into a fine state of division, they may simply be mixed with bicarbonate of soda and water, and left to themselves, when the conversion into carbonates goes on in the same manner, only much more slowly. Secondly, by mixing hydrated oxides of lead or basic salts of lead with caustic soda, mono-carbonate of soda, or acid carbonates of soda, and sufficient water, a stiffish paste is formed. The mixture is then introduced into a closed mill, and during the grinding a stream of carbonic acid gas passed into it. After the conversion of the lead bodies into carbonates they are washed with water, and the supernatant liquid treated as before mentioned.—3 *A, April* 8, 260.

DUCKHAM'S SELF-INDICATING WEIGHING MACHINE.

The London *Mechanics' Magazine* for August 19 gives a figure of what it considers a very important mechanical improvement, namely, Duckham's Self-indicating Hydrostatic Weighing Machine. This consists essentially of an open-top cylinder filled with water or oil, and fitted with a water-tight piston and pressure-gauge, and when used for weighing goods is simply interposed between the crane on which they are suspended and the goods themselves. The indicator on the dial-plate turns as the object is lifted, and the weight is read off at once, the work being accomplished with the utmost celerity and accuracy. The machine is in use at the Royal

Gun Factory, where masses of from thirty to fifty tons in weight can have their amount ascertained within a small fraction.—3 *A*, *August* 19, 143.

OIL FROM BIRDS.

Our readers may be surprised to learn that the oil obtained from several distinct species of birds possesses a decided economical value, and that various sorts are recognized as articles of trade in different parts of the world. In our own domestic medicine goose-grease is known as an emollient, and for other purposes. The penguins, petrels, mutton-birds, frigate-birds, Mother Cary's chickens, etc., all ocean forms, are sometimes killed, in immense numbers, for their oil, and to such an extent is the destruction of penguins carried in this connection, that while the fat of eleven penguins is required to furnish a gallon of oil, a single vessel has been known to bring back, after a six weeks' campaign, twenty-five to thirty thousand gallons, representing, of course, over ten times that number of birds. This is taken to London and used almost exclusively in currying leather. Ostrich fat has much reputation in Africa as a remedy for rheumatism, and is greatly sought after by the Arabs for this purpose. The emu, or Australian ostrich, is hunted very much for a similar purpose. A single bird will produce six or seven quarts of a beautiful bright yellow oil.

In South America a species of goat-sucker, known as guacharo (*Steatornis caripensis*), and remarkable for its excessive fatness, is hunted in large numbers by the Indians, the young birds especially. This species differs from the ordinary goat-sucker in being almost exclusively a vegetable feeder, the result of which is the deposit of a large quantity of fat under the skin. The oil is half liquid, transparent, and so pure that it will keep more than a year without becoming rancid. In many parts of North America the fat of the wild pigeon is said to be collected by the Indians both as an oil for light and as a substitute for butter. Very recently a trade has sprung up in the Gulf States in oil obtained from the American pelican, which, we learn, is actually quoted in the market of New Orleans at about a dollar and a half per gallon. A fleet of small vessels is occupied in following up these birds in their different haunts, and killing them, although the process

by which the oil is extracted is not indicated; nor is the reason given why the value of the product should be so great, compared with that of nearly all the other animal oils in market. It is much to be regretted that this new mode of extermination of our coast birds should have been initiated, and it may well be asked whether it is not the duty of the proper authorities to pass stringent laws prohibiting this practice. —14 *A*, *June*, 1871, 1006.

LUBRICATING OIL.

It is well known that in the friction of two surfaces together a certain amount of heat is produced, and that the office of a lubricator is to reduce this friction to a minimum by filling up the inequalities of the surfaces, and preventing their adhesion. The more completely this is done, the less heat is developed; or, in other words, the less heat produced by the mutual friction of two oiled surfaces in a given time, so much more valuable is the lubricator made use of. Upon this principle, a machine has lately been constructed for testing the comparative merits of lubricating oils, in which the amount of heat developed in a given time by a certain number of rotations, with oils of different qualities, is measured on an attached thermometer, and it is said that this apparatus is now largely used in various establishments for the purpose of furnishing the test in question.—5 *C*, II., 15.

REMOVAL OF LACQUER, OR LEATHER, FROM TINNED IRON.

According to Dr. Emsman, the adhesion of the lacquering upon articles of tinned iron, or ordinary tin, or of a leather covering on tin, may be destroyed in a very short time by making a cut through the substance of the coating, and applying a small quantity of mercury. This is rapidly taken up, and forms a soft amalgam with the tin under the outer layer, and allows the latter to be lifted off without difficulty. —14 *C*, CXCVIII., 164.

LACQUERING VARNISH.

A varnish recommended as well adapted for lacquering pictures and engravings, as well as for preserving dried plants and flowers, is prepared by pounding up ten ounces of gum sandarac, four ounces of mastic, and half an ounce of camphor,

and adding three quarts of strong alcohol. The mass is to be frequently shaken up, and finally placed in a warm situation until it settles. Plants coated with this varnish will, it is said, be protected from destruction by insects, and will retain their colors fresh and unchanged. This varnish does not peel off, and therefore, can be applied very thin.—5 *C*, XXVIII., 224.

TAR VARNISH.

An Englishman (Mr. Barker) has recently turned his attention to the manufacture of a kind of tar varnish, which is prepared by taking equal parts, by weight, of the refuse of coal-tar oils remaining after distillation, or treatment of the latter for the production of carbolic acid or naphtha, and of pitch or other equivalent substance, and combining with them about seven and a half parts, per cent., of chloride of sodium (common salt). These ingredients are then mixed with water, and the whole boiled together; the water and salt in solution are then drawn off from the pasty mass which has resulted from the operation of boiling, and a quantity of fresh water is added to the latter. The mixture is boiled, allowed to settle, and the water drawn off. The mass may be boiled or heated a third time; but this is rarely necessary, and, if considered desirable, sulphuric acid or other suitable drying agent may be added thereto. The proportion of common salt above mentioned is that which is preferred, and which is found most advantageous in practice, but it may be used in equal proportion to the other ingredients, and caustic soda may also be employed in the same proportion as the common salt, and either separately or in combination therewith.—8 *A*, *August*, 1870, 152.

PURIFICATION OF TURPENTINE.

The use of turpentine for cleaning gloves and other articles is materially interfered with by the unpleasant smell which remains behind, no matter how well rectified the turpentine may be. According to a recent French patent, this smell may be entirely destroyed by the distillation of the turpentine over tannin. Articles cleansed with turpentine thus treated are to be heated in a tub to a temperature of about 140°, by which, according to the statement of the patentee,

every trace of odor will be made to disappear. — 14 *C*, CXCVII., I., 96.

DEODORIZING PETROLEUM.

It is said that solar oil and petroleum can be deprived of their offensive smell by keeping them for two or three days in contact with a small quantity of chloride of lime; and that, after the lime settles, the oil can be poured off perfectly clear. The illuminating power of the oil is said not to be diminished, and the smell is that of a pleasant ether.—10 *C*, *March* 1, 59.

NEW METHOD OF RECTIFYING PETROLEUM.

It is announced that a French chemist has succeeded in discovering a process for rectifying petroleum, by the addition of a small quantity of a certain chemical product (not named) to the liquid before distilling, by which means an oil is obtained without any odor, even when burning, and the point of inflammability of which is so low that it must be heated to 177° before ignition occurs. The volatile gas, usually so readily disengaged from mineral oils, becomes so fixed that no evaporation takes place, and consequently the danger of fire and explosion is reduced to its minimum. The oils thus prepared, it is stated, can be made into soap, or can be mixed with vegetable oils, and burned like colza in carcel lamps. The soap made by this new form of petroleum oil is said to be very efficacious in diseases of the skin, and is also applicable to the destruction of insects. Articles washed with this are claimed to be ever afterward free from attacks by moths. This promises almost too much; but if the results at all approach the claims made for this oil, a very important advance will have been made in the manufacture of a safe burning fluid.*—3 *B*, *February* 3, 224.

PURIFICATION OF OLIVE-OIL.

The best quality of olive-oil is refined by preparing large, shallow tin boxes, with holes pierced in the bottom, which is then covered with a thin sheet of wadding. Four, five, or more of these boxes are placed on frames one above the other; and the oil, being poured in at the top box, soaks through the wadding and drops to the next box, and thus on to the last,

* We are subsequently informed that the substance in question is amyl-alcohol.

when it is allowed to run off into tanks. The wadding absorbs all the thick particles contained in the oil when it comes from the mills, and leaves it perfectly clear and tasteless. Oil thus refined is almost exclusively exported to Nice, where it is put into bottles, and sent all over the world as "Huile de Nice." Although we buy this oil in bottles, in Italy it is sold by weight. The total amount of this "Huile de Nice" exported from Oneglia in 1868 amounted to 121,822 hundred weight.—6 *A*, *August* 6, 171.

CLEANING PAINT.

Soiled paint, whether on wood-work or on canvas, may, it is said, be cleaned perfectly by first dipping a rag in finely powdered and well sifted Spanish white, and then rubbing the surface in question gently with it, thereby removing dust, grease, etc., from the colors. The surface is then to be washed in fresh water by means of a sponge, and rubbed off with a piece of soft chamois leather, and dried. The colors appear as fresh as new, and the whole process is said to have many advantages over the use of soap.—5 *C*, XXVII., 216.

CHLORIDE OF ZINC AS A PAINT.

Chloride of zinc, which has been used to advantage as a cement, is now highly recommended as a paint. A convenient application for this purpose is made by stirring a mixture of oxide and chloride of zinc in cream of tartar, adding starch enough to bring it to the proper consistency, and then boiling the whole and allowing it to cool. If the paint is to be colored in any way, a pigment of the desired shade of color is to be introduced before boiling with the starch. In the course of half an hour the paint becomes dry and hard in consequence of the formation of oxychloride, and the drying would be still more rapid if it were not somewhat retarded by the presence of the cream of tartar. This paint does not become darkened in the air, and is without smell; and even in winter, in consequence of its quick drying, will admit a second and third coat in the space of a few hours. It can be cleaned with soap and water like an oil paint, and its action, in consequence of containing the chloride of zinc, is as a preservative of wood, rendering it almost incombustible, a peculiarity which can be increased by adding a small quantity of borax.—8 *C*, *September* 22, 312.

ZINC WATER-PAINT.

The unpleasantness of occupying a newly-painted house may, it is said, be avoided by the use of zinc water-paint. Powdered oxide of zinc (which may be heated with a little potato starch if more "body" be wanted) is combined with the desired mineral or vegetable color, and with this an aqueous solution of chloride of zinc, to which some tartrate of potassa has been added, is then mixed, the water-paint thus formed being applied with a brush on the surface to be coated. In half an hour this paint will be perfectly dry, and the object of the alkaline tartrate is to make the drying process less rapid. The advantages of using the water paints are very numerous: they are more durable than oil paints, do not blacken by exposure to sulphurous vapors, are devoid of odor, dry quickly, resist dampness and the action of water, can be cleansed with boiling water and soap like oil paints, and preserve the wood to which they are applied from decay, and render it less combustible. This latter property may be increased by the addition of borax. Both the oxide and the chloride of zinc can be manufactured without danger to the health of the workmen, sold at a low price, and kept for any length of time in any climate.—8 *A*, *April* 1, 66.

PREPARATION OF ZINC PAINT.

A useful hint in regard to the preparation of paint with oxide of zinc instead of white lead will be found in the following instructions, published in a German journal: The ordinary boiled linseed-oil should be replaced in the mixing operation by one prepared by gently boiling two hundred pounds of the raw oil for five or six hours, then adding about twenty-four pounds of coarsely-broken lumps of binoxide of manganese, and continuing the boiling operation for about ten hours longer. In this manner a very quickly drying linseed-oil is obtained, which is eminently fit for the purpose of being used with zinc-white and other zinc colors. According to the writer of the article, much depends upon the use of old linseed-oil, and also upon the pains taken with the boiled oil, which, unless carefully kept from the contact of the air, becomes thick in a very short time. The boiled oil so prepared is not to be used alone in painting with zinc-white, but must

be mixed with from three to five per cent. of raw linseed-oil while the paint is being mixed together.—3 *A*, *May* 27, 388.

USE OF SOLUBLE GLASS IN PAINTING.

The *Technical Journal* suggests new applications of water-glass in the arts, but especially in painting, where it appears to furnish a means of applying certain colors to fresh wood or clean iron in a most efficient manner, and at a very slight cost compared with oil. It can also be used advantageously for painting houses, basket-ware, decorations for theatres, etc., and is especially suitable in the latter case, as it renders wood incombustible to a certain extent, instead of increasing the danger from fire, as with oil paint. Care must, of course, be taken to use only such mineral colors as are not decomposed by the glass, such as ultramarine, chrome green, Nuremberg green, yellow and red earth, ochre, green earth, terra de Sienna, etc. In coating paper with this paint, a little glycerine may be added to prevent its breaking. Coralline, ponceau, and vesuvine have also been used to advantage in connection with soluble glass.—6 *C*, *May* 19, 198.

PREPARATION OF WHITE LEAD FROM GALENA.

Experiments are now being prosecuted to test the value of an invention for preparing white lead direct from the ore. For this purpose, ordinary galena is treated in an ore-crusher, next roasted in an ordinary desulphurizing kiln, and then mixed with carbon (preferably in a state of finely-washed dust of anthracite coal) in the proportion of half and half. The mixture is next to be heated in a compound oxidizing furnace, when dense white fumes of vapor will pass off. These are conveyed into a separate chamber or receptacle, where the vapors are strained through screens or bags of muslin or other fabric, or are allowed to deposit by being slowly passed through an extended chamber, in the way lamp-black, oxide of zinc, etc., are usually collected.—8 *A*, *March* 1, 53.

THEORY OF BOILED OILS.

A valuable paper on boiled oils and varnishes, by Charles W. Vincent, has lately been read before the Society of Arts, of London, in which the theory of the various processes for preparing oils and varnishes is given, and suggestions for im-

provements made, based upon the experience of the author for many years past. In this paper attention is called to the importance of the announcement, by Chevreuil, that the act of drying of linseed-oil is due to the absorption of oxygen, and that too long boiling retards the drying of oil instead of hastening it. The practical application of this first point has been the suggestion of various devices having for their object the supplying of oxygen in greater quantity, in a given time, than would naturally be taken up from the atmosphere. Another point of progress in regard to the manipulation of this substance is said to consist in the discovery that the high temperature formerly employed in boiling oil is unnecessary, and that the work can be done to much better advantage by the use of steam, with a great improvement in the color of the oil and in its practical value.

According to our author, a valuable application was made of the theory of the absorption of oxygen in drying by Faraday, some years ago, when consulted as to the possibility of hastening the drying of printing-ink so that the work might be milled or plated (pressed between sheets of zinc) with less delay after printing, a fortnight being the usual time required before this process can be attempted. At Professor Faraday's suggestion, binoxide of manganese was added to the ink, with such effect that for thirty or forty years this substance has been used with perfect success for accomplishing the desired object, at the Queen's Bible Office, where the work, if necessary, is milled in three days after printing. To get the binoxide in a state of division sufficiently fine to be mixed with printing-ink, Faraday devised a series of washing receptacles, like successive stairs, the fine particles passing on to the lower vessels being longer suspended than the coarser—a simple yet ingenious arrangement, which enabled the ink to be worked without any risk to the plates or forms from grit.—1 *A*, *April* 28, 197.

TRANSPARENT GREEN VARNISH.

A beautifully transparent green varnish is made by taking a small quantity of Chinese blue, with about twice the amount of finely-powdered chromate of potash, and stirring these in copal varnish thinned with turpentine. A thorough grinding of this mixture must be made for the purpose of in-

timately incorporating the ingredients, as otherwise it will not be transparent. A preponderance of chromate of potash gives a yellowish shade to the green, and a deficiency increases the amount of blue. This varnish, thus colored, produces a very striking effect in japanned goods, paper-hangings, etc., and can be made very cheaply.—18 *A*, *August* 18, 551.

REMOVING THE SMELL OF PETROLEUM.

Professor Stolba publishes what he considers the best method of completely removing from glass or other vessels the smell of any petroleum which may have been previously contained in them. This simply consists in introducing a suitable quantity of milk of lime and shaking it around thoroughly, and, after allowing it to stand for a time, repeating the operation in a few minutes. At the same time the external surface of the vessel is to be washed with a rag dipped in the same substance. Petroleum forms an emulsion with the milk of lime, and can thus be readily removed. If particles of thickened petroleum adhere to the glass, these can be removed by washing with fine sand, or by other mechanical means.

After emptying out the emulsion produced, it is only necessary to rinse with water, after which as much chloride of lime as will go on the point of a knife is to be introduced and shaken with water, and then allowed to stand about an hour, the exterior being rinsed off in a similar manner. If the liquids referred to are used hot, this operation will be materially facilitated.—14 *C*, CCI., 148.

GERMAN METHOD OF REFINING PARAFFINE.

A German method of refining paraffine consists in pouring the crude material into an ordinary mixing apparatus provided with a steam jacket, to which the steam is supplied to keep the contents warm. The cover of this mixing apparatus is made to close securely, to prevent any possible loss of alcohol; and it is connected with a condenser so arranged as to condense the alcohol as it evaporates, and return it to the mixing apparatus, after the manner of an inverted Liebig condenser. This apparatus is provided at the bottom with a cock for running off fluid substances. The mixing is best

accomplished by means of a stirrer in the form of a screen or sieve. The alcoholic lye should be freshly prepared before each operation.—8 *A*, *August*, 152.

VOHL ON EXTRACTION OF FATS.

Much difficulty is experienced in keeping lard and other animal fats for any considerable length of time without their becoming rancid or acquiring some accessory taste which renders them less fit for use. This rancidity results from several general causes, in most cases in consequence of the presence of water, or from a mixture of some nitrogenous substance. These fats are generally obtained in two different ways: In one, the raw fat is boiled with water, the clear, melted fat skimmed off, and the remaining water removed by adding pulverized salt, or otherwise. In the other, the fat is cut into pieces after it has been washed with water, and heated without water at an elevated temperature, either with or without the addition of salt. In the first instance there is usually a considerable percentage of animal matter, especially of gelatine and fibrin, mixed with a certain percentage of water, which speedily pass into decomposition. In the second case, although this difficulty is less troublesome, there is almost always a burned taste, and more or less of color, while rancidity is less common.

In a late article, Dr. Vohl, of Cologne, presents what he considers a greatly improved method for the extraction of animal oils, so as to have them entirely free from the foreign substances referred to, and consequently not liable to change. For this purpose, the fresh, raw fat is to be freed as completely as possible from the adherent particles of flesh and skin, and cut up into thin slices or small cubes. These are then to be washed with cold water (as free as possible from lime) until this runs off entirely colorless, and no particles of blood remain in the fat. When properly drained off, this washed fat is to be placed in a cylindrical tub-shaped stone-ware vessel of about four feet in height, and a foot and a half in diameter, which is inserted in a water-bath, which can be heated by steam to the melting point of the fat. At the bottom of the vessel is a cock of wood, earthen-ware, or porcelain, so attached that the vessel can be emptied while in the bath. After the vessel is filled to about three fourths of its capac-

ity with raw fat, a sieve-like, perforated disk of stone-ware is to be laid upon the surface of the pot, and 10 per cent. of extremely diluted and chemically pure hydrochloric acid added, in a proportion of three pounds of the acid (of 1.12 specific gravity) to 100 pounds of water. The vessel is then to be covered with a well-ground and tightly-fitting stone-ware top. By heating, the fat is melted in the cells, the membranous walls of which are dissolved by the diluted acid, allowing the fat to escape, which rises above the disk, this at the same time gradually sinking toward the bottom. All the membranous, unmelted portions are carried down under it and accumulate at the bottom with the dilute acid.

When all the fat is melted and all the membranous portions destroyed, the acid liquid is to be let off and the fat washed two or three times with hot water. (This acid gelatinous solution can be converted into an excellent manure by the addition of a powdered phosphorite.) A small quantity of carbonate of magnesia is to be added in the last washing, so as to neutralize the acid. The fat, thus washed, is next dissolved in its volume, or less, of Canada oil (a petroleum), in the course of which the water and nitrogenous animal substances are removed, and may be separated by decanting. The clean fatty solution may then be introduced into a tinned copper distilling apparatus, and the solvent again recovered by distillation. The resulting fat will be completely free from smell, taste, and color, and is absolutely neutral, containing no trace of water or nitrogenous substances, on which account it can be kept without change for years. Although this method is somewhat tedious, it is yet effective; and, taking into consideration the much greater quantity of fat extracted and its greater purity, its economy will be amply vindicated.—14 *C*, CCI., 203.

LIQUID SOAP FOR CLEANING WOOL.

An excellent liquid soap for cleaning and washing raw wool, according to Moser, may be prepared by using a kettle in which the mass can be heated, by means of a steam-tube opening directly into it. The kettle (holding one hundred and fifty gallons) is first to be half filled with water, which is then to be heated, and sixty-eight pounds of caustic soda of 42° B., and one hundred and twenty-five pounds of oleine

added to it. This soap is to be boiled thoroughly for twenty to thirty minutes with continued stirring, and is then ready for use, forming a very homogeneous so-called soap-glue, of a sirupy consistency, and especially adapted for washing wool. Should the soap be required for fulling, an addition of some ammoniacal salt will be of advantage, to be introduced immediately before using. Instead of caustic soda, which it is sometimes difficult to obtain, we may use ordinary soda salt, which is to be rendered caustic by leaching through freshly burned and slightly moistened lime. Even ordinary potash-lye, obtained from ashes, mixed with fresh quicklime, can be employed in this preparation.—23 *C*, XVI., *August* 15, 223.

UTILIZING THE GREASE OF SHEEP'S WOOL.

An additional instance of the possibility of converting what was formerly considered refuse into valuable material is seen in the case of the fatty matter contained in sheep's wool, and technically known as suint. This contains about forty per cent. of potassa, and, when ignited, the alkali becomes entirely mixed thereby with strongly nitrogenized animal charcoal. The result of recent experiments tends to show that suint, thus treated, may be used to an excellent profit in the manufacture of prussiates and cyanides.—16 *A*, *April*, 1870, 260.

WASHING POWDERS.

According to a high German authority, recent investigations of a great variety of so-called washing powders—many of them of loud-sounding pretensions, and bringing high prices—showed that their efficiency depended entirely upon the amount of soda they contained, which was, in most cases, of so poor a quality as to be of comparatively little value. The author advises the public, therefore, to have nothing to do with any such compounds, but to rely entirely upon obtaining a good quality of soda, which may always be secured, and at a low price.—25 *C*, XX., *May* 24, 166.

REMOVAL OF GREASE FROM WOOL.

It is said that the best method of removing tar, axle-grease, etc., from raw wool consists in exposing the portion affected in a closed vessel for a short time to the action of benzine. By a previous application of old butter to the wool, and al-

lowing it to remain for some time, it is said that the attainment of the desired result will be much facilitated.—6 *C*, v., 40.

METALLIC SOAP.

Metallic soap in linseed-oil is highly recommended for coating canvas for wagon-covers, tents, etc., as being not only impermeable to moisture, but remaining pliable for a long time without breaking. It can be made with little expense, as follows: Soft soap is to be dissolved in hot water, and a solution of copperas (sulphate of iron) added. The sulphuric acid combines with the potash of the soap, and the oxide of iron is precipitated with the fatty acid as insoluble iron-soap. This is washed, and dried, and mixed with linseed-oil. The addition of dissolved India-rubber to the oil greatly improves the paint.—10 *C*, v., *May*, 1871, 60.

WATER-PROOF STARCH.

A patent has been recently taken out in France for the preparation of a finish, or starch, for vegetable tissues, yarns, cloths, etc., which is not soluble in water, and which, therefore, when once applied, will remain throughout several successive washings. In this case, the articles in question are properly starched, and then passed, at a temperature of about 60° Fahr., through a bath of chloride of zinc, by means of which such a change is produced in the fibre and the starch that the latter resists the action of the water in the most thorough manner. A bath of three parts of sulphuric acid and one of water may, it is said, be used instead of that of chloride of zinc. The liquid is to be placed in a trough, in which a revolving barrel is immersed almost to its axis, and above which is a roller which is moved in the opposite direction by the turning of the lower one. Between the two the material to be impregnated is passed, being moistened from below by the bath, and, in passing between the two, receiving the necessary pressure. If the material be heavy, the barrel lies entirely in the bath, and a pair of rollers fixed above it is used to press out the superfluous liquid. The articles are carried directly from the trough into running water, from which they are to be removed, pressed out, and dried.—5 *C*, XVI., 127.

CHINESE WATER-PROOFING.

According to Dr. Scherzer, the Chinese are in the habit of making use of a composition called schioicao, which has the property of rendering wood and other substances perfectly water-tight. This is stated to be composed of three parts of blood deprived of its fibrin, four of lime, and a little alum. A card-board covered with this is said to become as hard as wood, and it is constantly used in coating wooden buildings in Pekin, so as to render them water-proof.—18 *A*, *January* 13, 408.

WATER-PROOFING CLOTHING.

A method of rendering fabrics water-proof, either in the piece or when made up into garments, without at the same time impeding transpiration, and one lately recommended in Paris for military purposes, consists in the use of an acetate of alumina, prepared by the mutual decomposition of solutions of acetate of lead and of sulphate of alumina. The fabrics are dipped in this solution and then dried, in which process acetic vapors are developed, and basic acetate of lead remains behind, thus protecting the cloth completely against wet, without being itself visible or appreciable in any other way. The application will hold good for a long time if the portions of the dress exposed are occasionally moistened with the solution by means of a sponge.—6 *C*, 1870, *December* 15, 502.

COMPOSITION FOR WATER-PROOFING.

Thirty grains of gum arabic are first dissolved in two hundred and fifty grains of water. To this are added thirty grains of the spirits of wine of commerce; three hundred grains of sulphate of alumina, of potash, or of soda are then to be ground in a mortar to a fine powder, and to this is added, little by little, the gummy solution mentioned above. The whole is kneaded together, and moulded into blocks or cakes ready for use. To apply water-repellant compositions, such as above described, to fabrics, to render them water-proof, the composition is dissolved in water. If the solution is to be used for treating woolen fabrics, the composition is dissolved in about one hundred and fifty times its weight in water; if for cottons, in about one hundred times its weight;

and if for linens or silks, in about seventy-five times its weight. —8 *A*, *April* 1, 66.

WATER-PROOF CLOTH.

A firm in Berlin has for some years furnished a completely water-proof cloth, the process for making which has been kept a secret. It is now stated, however, that the method consists in all probability in saturating the cloth at first with a solution of sulphate of alumina and of copper, and then immersing it in a bath of water-glass and a resinous solution of soap. The object of the copper seems to be to protect the cloth from rotting or stiffening more perfectly than can be done by the alumina alone.—8 *C*, xx., 157.

ANTIFLAMINE.

A preparation known as antiflamine has recently been brought into notice in Paris for the purpose of extinguishing fire in case of accident. It consists of aluminous and magnesian silicates reduced to fine powder, and dried at 212° Fahr., seven hundred parts by weight; chloride of magnesium in crystals, two hundred parts; sulphate of soda, fifty parts; and tartaric acid, one part=1001. The article is supplied in a pulverulent form, and is perfectly soluble in water. It is proposed to mix it with the water in the fire-engines, the effect of which, it is claimed, is to lower the temperature, and to surround the burning material with gases which will not support combustion.—8 *A*, *July*, 125.

GRÈGE YARN.

In a recent number of Dr. Reimann's Dyers' Gazette we find some interesting statements in regard to the so-called Grège yarn. This yarn is spun of wool and silk, and combines the greatest strength with the utmost fineness, and can not be replaced by either wool or silk alone in the manufacture of long shawls where it serves as warp. This was first, and for many years exclusively, made in France, so that in its manufacture the French were enabled to monopolize the markets of the world. The Germans, in beginning the cultivation of this branch of industry, were obliged to import the Grège yarn. In spinning this yarn there are great and peculiar difficulties. No silk must appear in the fabric, only just enough of it be-

ing added to the wool to insure the combination of the greatest strength and greatest fineness. Yet it is said that in Germany, especially in Berlin, all the difficulties in the way of spinning this yarn have been overcome, and the fabrics manufactured from it there even surpass in strength those made in France.—5 *C*, 1871, 106.

DETECTION OF SILK IN FABRICS.

According to Mr. Spiller, silk can always be identified in a mixture with any other animal or vegetable fibre by means of concentrated hydrochloric acid, which dissolves it completely and immediately without appreciably affecting any woolen or woody fibre with which the silk may have been interwoven. Strong sulphuric acid has also a powerful solvent effect upon silk, and is likewise much more destructive in its action upon cotton than the other acid. Should it be desired to determine the nature of any fibres remaining after the solution of the silk, it is first necessary to wash and collect them, when they will usually be found destitute of color. To decide whether wool is present or absent, a solution of picric acid may be employed, which instantly imparts a full yellow tint to the wool, but does not in the least affect cotton, linen, or China grass, so that it is only necessary to immerse the fabric in the dye, wring it out, and wash well with water. Should any portion remain of a yellow color, the presence of wool is indicated. Other methods can be employed similar in principle, but the picric acid is believed to be best. Discrimination between the different kinds of woody fibre can best be prosecuted by means of the microscope.—18 *A*, *October* 21, 102.

PEARL HARDENER.

A substance known as pearl hardener, introduced a few years ago for the purpose of hardening paper, is prepared by precipitating hydrated sulphate of lime from a perfectly pure solution of chloride of calcium, by means of sulphuric acid. Great care is taken in its preparation, and it is coming rapidly into use for the purpose of increasing the weight and density of paper pulp. At the present time it is said about 3000 tons are made annually in a single town in England.—17 *A*, *December*, 186.

DETECTION OF WOOD PULP IN PAPER.

Professor Wiesner, in an article upon the detection of woody fibre in paper, calls attention to the insufficiency of the test of Schapringer, namely, sulphate of aniline, which, although sometimes reliable, yet fails under certain circumstances. He maintains, however, that the examination of the finely-divided particles by the microscope will test this question much more thoroughly, the peculiar cells of the wood being easily distinguishable from those of linen, cotton, or other fibre.—14 *C*, CCI., 156.

ADULTERATION OF WOOL.

An additional illustration of the modern tendency to adulterate articles of commerce (in this instance, fortunately, the result not being injurious to health), we find in an advertisement in a recent German journal offering to sell the secret of a process by which wool, in the yarn or the fabric, can be made to weigh from ten to twenty-five per cent. more than originally, according to the color desired, and without injury to the fibre, or affecting the most delicate colors, or the physical character of the article in the slightest degree.—24 *C*, XXIII., 183.

VALUE OF RAMIE FIBRE.

The practical difficulties attendant upon the manipulation of the ramie fibre seem to be disappearing, as we find that this substance is now quoted in the Liverpool market at $264 in gold per ton. This will doubtless be good news to such of our readers as have either actually entered upon the cultivation of the plant or have it in contemplation, as at this price it is said to be considerably more profitable than cotton. Its advantages, as claimed, lie in its ready and vigorous growth, continued from year to year, and, once planted, it requires no renewal or attention for a long time. It is said not to be destroyed by worms, not to suffer from peculiarities of climate, soil, insect enemies, etc., and to require but little labor to establish a plantation, where it grows rapidly and yields largely, and, commanding a ready market at a high price, there now seems nothing needed to stimulate its cultivation to a great extent. The portion of our country

where this plant can be raised to advantage is perhaps limited; but within its natural area it is thought that it can be produced with greater profit than almost any other species of fibrous plant. The drawback to this flattering picture lies in the difficulty of separating the fibre from the bark, and the bark from the stalk; but this the editor of the New York *Shipping List* thinks will be eventually overcome, as it is not often that any practical problem of this kind long resists the pertinacious attentions of modern inventors. As we have already informed our readers, the East Indian government has proposed a prize of $25,000 for a machine or process that will accomplish this object. The award has not yet been made, the period having lately been extended, owing to the unsatisfactory nature of the competing machines. The offer, however, still holds good, and the prize will, we presume, be assigned in due course of time.—*Shipping List, May* 6, 1871.

A NEW FIBRE (APOCYNUM).

Nettings and cordage were to some extent, at one time, made in Virginia and other states of North America of the fibre of the bark of *Apocynum cannabinum*, especially by the Indians, who, indeed, still use this plant for the purpose to some extent. In the report of the Russian Exhibition in St. Petersburg in 1870, various articles were there shown as made of a similar plant which are well worthy of attention. Woven fabrics of snowy whiteness and silken gloss, brownish-yellow fishing nettings, hunting-pouches, shoes, etc., from Southern Siberia, were strikingly beautiful. They were all made from fibres of *Apocynum venetum* and *Apocynum sibiricum*, the use of which, for such purposes, is quite common in Southern Siberia, along the Caspian Sea, the steppes of Southern Russia, etc. The plant grows to the height of from two to eight feet, is easily stripped of its bark after roasting, is readily separated into its fibres, and, by bleaching, becomes of a beautifully white and clear lustre.—*C* 1, 1871, 264.

NEW ZEALAND FLAX.

Among the substances used in the arts as fibres, the New Zealand flax at one time promised to be of great prominence, but, owing to its high price, and the difficulty and expense

of bleaching it, it has not been employed in so many applications as its strength and other qualities warrant. The principal difficulty in making a profitable use of it has been from the tenacity of the gum which envelops the fibres. This, according to a late writer, consists of three distinct substances: First, an actual gum, found only on the upper leaves and near their bases, and readily dissolved by boiling water, or removable by mechanical means; second, a bitter principle, which, it is suggested, may be used as a dye or stain for wood, and a mucilage, both easily extracted; and, third, a kind of cement, only to be removed by boiling water and alkali, and upon the retention of which the strength of the fibres depends.—3 *A*, *April* 7, 62.

BAOBAB BARK AS A NEW FIBRE.

It is well known that great efforts are being made all over the world to increase the supply of material for the manufacture of paper and textile fabrics, by calling into play substances previously unthought of in this connection. Among the later additions to the series may be mentioned the fibrous bark of the baobab-tree (*Adansonia digitata*). This is said to be worth in England from $70 to $75 per ton. It furnishes also an almost indestructible cordage.—3 *A*, 1871, 505.

CATTELL'S METHOD OF PREPARING VEGETABLE FIBRE.

A system of utilizing vegetable fibres that does not involve the practice of rotting has lately been devised by Dr. Cattell, and is said to be coming rapidly into use. The special superiority of the fibre prepared by this system is said to be that it possesses a greater degree of strength, estimated at twenty per cent. over the rotted article. The yield of fibre is also considerably greater from the same weight of material, while its divisibility can be carried to much more than the ordinary degree, and the whole labor accomplished in much shorter time.—3 *A*, *December* 23, 1870, 459.

TREATMENT OF WOOD FOR PAPER PULP.

Mr. Manè informs us that the proper method of treating wood to make it a suitable material for the manufacture of paper consists in first reducing it to a state of shavings or

sawdust, and then placing it for a time (the duration of this depending upon the nature and state of division of the wood) into water, and leaving it there to rot, as is done with flax. By this treatment a great many substances are removed from the wood, which is consequently afterward more readily reduced to pulp. The rotting in water has the effect of disintegrating and partly decomposing the nitrogenous matter of the woods, which is also afterward more readily bleached, not demanding the use of chlorine, as is the case where these matters have been left in the wood. The rotted wood, previous to any other treatment, is to be thoroughly washed with boiling water and steamed, and next treated with an alkali.—1 *A, October* 15, 1870, 192.

UTILIZATION OF COTTON SEED.

Various movements have been made of late years looking toward the utilization of cotton seed, usually considered a burden to the cotton planter, and in getting rid of which great ingenuity has been expended. Among the more recent propositions of the kind, that of the employment of the adhering cotton, and perhaps of the woody material, in the manufacture of paper, has been brought forward, and a calculation presented as to the number of tons of paper stock that could thus be introduced into the market. Lately, large establishments have been started in the South for the purpose of obtaining the oil from the seed, the refuse being converted into oil-cake for fattening cattle. The crude oil brings in New York from thirty-five to forty cents a gallon, and the oil-cake commands nearly the price of corn, being said to equal it in its fattening qualities. Shipments of the seeds have been made recently in great quantities to Liverpool from New Orleans, one vessel taking over ten thousand sacks of the seeds, and about one thousand sacks of oil-cake, and it is expected that these shipments will be followed up on a large scale. As over two million tons of cotton seed are every year produced in the South, we may well imagine how important it will be to our country should the whole of this now nearly waste substance be utilized in some form.

The comparative value of winter refined cotton-seed oil and of olive-oil may be gathered from the fact that at the latest dates the former is quoted in the New York prices cur-

rent at seventy-two cents per gallon, while the latter, with duty off, brings only one dollar in gold.—*N. Y. Shipping List, December* 24, 1870.

UTILIZATION OF COTTON FIBRE.

A communication was presented to the British Association at its late meeting in regard to the utilization of the fibres of the cotton seed. The author expressed his astonishment that a vegetable production which was capable of so many important applications, and could be supplied by millions of pounds, was now entirely wasted, the amount thus thrown away in America alone being a million and a half tons.* According to Mr. Rose's estimate, as the seed is composed of 50 per cent. of kernel, yielding about one third of oil, and 50 per cent. of husk, one third of which is fibre, the wasted seed should produce 250,000 tons of pure cotton, 250,000 tons of oil, and 5000 tons of cattle-cake, representing the value of $1,000,000. The husks could then be taken to a paper-mill, and the cotton abstracted in such a state as to form most valuable material for paper. By a process devised by the speaker, the cotton fibre could be completely separated from the shell. He stated that a very slight alteration in the ordinary machinery for manufacturing paper will enable this material to be utilized.—15 *A*, *October* 8, 1870, 469.

TENSION OF COTTON FIBRE.

In the course of some experiments by Mr. O'Neill upon cottons, he ascertained that the average length of the staple of Sea Island cotton amounted to nearly two inches, while that of Surat cotton was but little over one inch. The tensile strength of this cotton is, however, much inferior to that of many other qualities, breaking with eighty-three grains, while Pernambuco cotton and Surat cotton sustained a weight of one hundred and forty grains. It is said that the amount of twisting in cotton thread is a very important element in the estimate of its strength, and that the Dacca muslins of India owe much of their superiority in lightness and strength to the tightness of the twist of the delicate filaments of which they are composed. According to Dr. Watson, the average number of twists per inch in a French muslin is sixty-eight,

* The crop of 1870 would yield at least two millions of tons.

in an English fifty-six, and in a Dacca they amount to one hundred and ten. Some idea of the lightness of this Dacca muslin may be inferred from the fact that a piece of it one yard wide and ten yards and a half long weighed only a little over three ounces! This, as an article for summer wear, would probably be quite equal to the ancient Greek fabric poetically termed "woven wind" by the writers of that country.—1 *A*, *April* 14, 172.

PRIZE FOR RHEA FIBRE MACHINES.

According to *Nature*, the time for the trial of machines for separating the fibres of the rhea plant, which are to be sent in for competition for the prize of $25,000 offered by the Indian government, has been postponed till April, 1872. It is requested that notice of intention to compete be given. Arrangements have been made to supply those who propose to become competitors with some of the plant for experiment. —12 *A*, *April* 1, 71.

LEATHER PAPER.

A late English patent endeavors to utilize scraps of leather or skin by manufacturing from them a paper in combination with rags or other fibrous substances. For this purpose the refuse cuttings of any kind of leather are taken, those of calfskins, however, being preferred.—8 *A*, *June* 1, 110.

WETTING PRINTING PAPER BY ATMOSPHERIC PRESSURE.

The Imperial Printing Office in Vienna uses the air-pump to great advantage in moistening large quantities of paper for printing. The paper to be used is placed in a box capable of being closed air-tight, and the air is then removed by means of the air-pump. Water is then admitted into the box and driven through the paper by means of the returning pressure of the atmosphere. The superfluous water is removed after the wetting by the use of the screw press.—14 *C*, CXCIX., 152.

BURNT PAPER.

It is sometimes important to be able to determine whether burnt paper belonged originally to bank-notes or ordinary writing paper; and it is stated in a Russian Journal that, if

the substance to be tested be calcined in a covered platinum crucible, and the ashes carefully examined by means of a lens, the printed figures, letters, and sometimes entire words, or the ornamentation of bank-notes, can be readily recognized.—13 *C, November* 18, 1871, 1578.

PAPER FROM OAT REFUSE.

Paper is manufactured from oat refuse by Mr. Hay, of Glasgow, by first immersing the oat husks in water in a tank in order to float off mustard and other seeds, with which they are frequently more or less mixed, and which, if not separated, materially deteriorate the quality of the paper. It is of advantage to have the water well stirred, as it facilitates the separation of the foreign seeds, and allows them to float to the surface. The oat husks are then allowed to settle, and the surface scum and floating seeds are drawn off by an overflow pipe at the top of the tank, or skimmed off by a rake or other tool, or otherwise removed; after which the water is drained from the oat husks by a waste-water pipe at the bottom of the tank, and beneath a perforated false bottom, or fitted with a strainer which retains the oat husks. The oat husks may be left to steep in the water for from five to ten hours after or during the removal of the scum, as this steeping, by softening them and helping to loosen the silica from the fibre, facilitates the subsequent boiling process.—8 *A, October* 1, 193.

PARCHMENT PAPER.

The use of parchment paper for the preparation of deeds and other purposes is increasing very rapidly, and is replacing the genuine parchment in a great many of its applications. An improved method of preparing this substance, according to a late article, consists in using the commercial oil of vitriol in an undiluted state. The paper is first passed through a solution of alum, and thoroughly dried previous to its immersion, thus preventing any undue action of the corrosive principle of the vitriol. After the application of the acid the paper is passed into a vat of water, and then through an alkaline bath, to be again washed. Written and printed paper may undergo this improved process without materially affecting the clearness and distinctness of the letters, and the

paper retains all its qualities, even after being wetted several times in succession, while paper prepared in the usual manner loses, to a great extent, its pliancy, and becomes hard and stiff.—17 *A*, *September* 1, 139.

RED AND VIOLET FUCHSIN VARNISH FOR PRINTING.

Mr. A. Müller recently instituted a series of experiments for the preparation of a red and violet fuchsin varnish, suitable for printing woven fabrics. His process, which has proved entirely successful, consists in mixing an alcoholic solution of gum shellac with a like solution of fuchsin, and exposing the mixture to different temperatures in a vapor bath. The color changes with the temperature from rose, amaranth, reddish violet, and pure violet to blue, and can be rendered permanent at any step in the operation. The varnish thus obtained, when properly diluted with alcohol, is ready for printing. The color is fastened in a simple manner, not as yet disclosed; after which it resists the influence of boiling water and hot solutions of soda and soap, and is not easily affected by light.—5 *C*, 1871, 95.

ACIDIFICATION OF ALCOHOL BY LYCOPODIUM.

It is said that if alcohol is digested with the seeds of the club-moss, or *Lycopodium*, it will soon show an acid reaction, due to the development of vinegar.—1 *C*, III., 48.

DETECTION OF LOGWOOD DYE IN WINE.

To detect logwood in wine it is only necessary, according to the *Journal de Pharmacie*, to place strips of good filtering paper in an aqueous solution of neutral acetate of copper, and then dry them. Wine suspected of coloration with logwood may be tested by dipping a slip of the prepared paper into it, and, after removal, allowing the adhering drop of wine to flow backward and forward over the paper, which is to be rapidly dried. If the wine be pure, the color exhibited after drying will be gray or rose-red grayish, but if logwood be present the tint will be distinctly sky blue.—5 *A*, *July*, 1870, 307.

ALBUMEN CHARCOAL.

A preparation called albumen charcoal has been devised for the purpose of clarifying sugar sirups, and for which it is

said to answer an excellent purpose, a very small quantity only being required. Its application in clarifying wines has been suggested, although it is not stated whether it is exactly suitable. To prepare this substance, finely powdered and purified animal charcoal is to be mixed to a stiff dough with white of egg, and torn apart into small pieces, dusted with the charcoal, dried, and pulverized, and again kneaded with egg albumen to a dough, which is to be dried and powdered anew.—6 *C*, *August* 10, XXXII., 318.

EXTRACTING JUICE FROM SUGAR-CANE, ETC.

A new method of extracting juice from sugar-cane, beet-root, etc., by the process of diffusion, has been announced in the foreign journals. For this purpose the cane, or other original substance from which the juice is to be extracted, is to be first cut in slices by a special machine, and then placed in a series of closed water-tight tanks, and brought in contact with water at an elevated temperature in a certain succession and systematic order. Another method consists in carrying out the whole process of diffusion in a single vessel, in which the extraction of the sugar is carried on continuously by introducing slices of cane through a feeding apparatus at the bottom of the vessel, from which they rise slowly to the top, while fresh water is constantly running in at the top of the diffusing vessel, and is drawn off at the bottom as diffusion juice, after having remained in contact with the slices for a certain length of time. The liquid during the operation is agitated by machinery. It is suggested that this process may be applied on a small scale in domestic operations in making such drinks as lemonade, etc.—17 *A*, *June* 1, 92.

DIFFUSIVE PROCESS IN MAKING SUGAR.

When sugar-cane is crushed for the extraction of its juice, it is well known that a large portion of the juice is taken up by the fibre, and that the amount saved is much less than that which actually exists in the plant. To remedy this defect, the method called the diffusive process, which has been so successful in the treatment of the sugar beet, has lately been adopted with very satisfactory results. This consists simply in dissolving out the saccharine matter with water, and then concentrating the juice in the proper manner. In a

certain sugar establishment in Madras, where this process has been introduced with great success, the cane is cut into thin slices by machines, six of which were capable of cutting nearly one hundred tons of cane in twenty-four hours. The subsequent treatment is similar to that with beet-root juice, and requires no filtering through animal charcoal. The great advantage claimed, however, is that eighty-two per cent. of the saccharine matter is secured by the diffusive process, against seventy per cent. by the ordinary method.—17 *A*, *June* 1, 92.

ANALYSIS OF SACCHARINE MATTERS.

During the late meeting of the British Association, Dr. Apjohn gave a brief sketch of the methods of analysis usually applied to different varieties of saccharine matters, stating that they were three in number, namely, the optical method, the chemical method, and that in which both these methods are combined. He then explained the principle on which the saccharometer of Edhil is based, and how, with the aid of this instrument, and a double observation with it, one before and the other after inversion of the sirup, the amount of cane-sugar in the saccharine material is determined. He considers the information thus obtained of the highest value, the cane-sugar being by far the most valuable constituent of crude saccharine matter. But the analysis is imperfect, since it gives no information as to the amount of the inverted sugar and the grape-sugar, which are invariably associated with the cane element, and does not even make it possible to assign the aggregate quantity of these varieties of sugar. The analysis, however, may be completed in a very simple way, namely, by acting with the sirup, after its inversion, upon Barrossmill's solution of copper, by means of which a third equation is obtained, which, as there are only three unknown quantities, conducts at once to a complete solution of the problem. The object of this paper, as stated by Dr. Apjohn, was principally to call the attention of chemists to the present imperfect state of saccharine analysis.—18 *A*, *August* 25, 562.

MAKING SUGAR FROM FALLEN CANE.

At a meeting of the Academy of Medical, Physical, and Natural Sciences of Havana, Mr. De Castro presented a com-

munication of important practical moment, bearing upon the feasibility of obtaining sugar from cane that has fallen to the ground and thrown out roots into the earth from its joints. It has generally been supposed that the development of these roots takes place at the expense of the crystallizable sugar; but a critical comparative analysis, made by Dr. Koehl at the plantation Las Cañas, of juice extracted from the normal cane, and from that which had thrown out the roots in question, shows that the development of the latter does not interfere appreciably with the amount of sugar in the cane, or, at least, to so slight an extent as not to affect the saccharine richness of the plant. For this reason, fallen cane, and cane which has been thrown down by hurricanes, can be turned to almost as good account as if it had remained erect.

IMPROVEMENT IN REFINING SUGAR.

A much-needed improvement has lately been made by Dr. Seyforth, of the Brunswick sugar refinery, in regard to the purification of sirups and molasses in the manufacture of sugar, especially that from the beet. As is well known, the juices and liquors employed in the first extraction of beet sugar from the raw material, as well as the sirups resulting from the sugar-refining process, generally contain a certain quantity of alkaline substances. By treating the saccharine juices with milk of lime, several of the bases of the alkaline salts present in the juices are separated from the acids they were at first combined with, and, by thus being set free, and remaining mixed with the sugar, impede crystallization. One part of alkaline matter can absorb as much as four parts of sugar, and some kinds of molasses contain as much as eight per cent. of alkali.

Various means have been used to remedy this defect; among them, more particularly, sulphuric and phosphoric acids, the use of which, however, is in most instances unadvisable, for various reasons. Sulphurous acid has also been recommended, and used with excellent advantage.

The method of Dr. Seyforth consists in introducing the sulphurous acid, either in the form of gas or as a weak active solution, into the vacuum pans. In this way it becomes possible to bring all particles of the sugar solution (or sirup) into contact with the sulphurous acid, and to eliminate, by the

joint action of heat and vacuum, any excess of that acid, which, however, not only saturates free alkalies and carbonate of lime, but also sets the organic acids which may be present, as alkaline salts, free from those combinations. The sulphurous acid thus takes hold of the bases they were combined with, while the greater part of the organic acids are volatilized along with the steam. Thus the sulphurous acid promotes the good and ready crystallization of the sugar, while its action as a decolorizer comes also into play. The details of the new process embrace the two operations of the manufacture of the acid in a simple form, and its introduction into the vacuum pans. The quantity to be applied in any solution varies from four to eight, or from ten to fifteen per cent. of the bulk of liquid sirup to be evaporated. The process is said to involve very little cost, to require no inconveniently large space, to be applicable to any existing manufactory, and to be very easily understood by manufacturers.—1 *A*, *November* 18, 1870, 248.

PERFORATING MACHINERY.

At the present time the machinery first brought into play for perforating sheets of postage stamps, in order to their more ready separation, is now applied to many other purposes, especially for coupons, bank checks, and other similar objects, by which the necessity of using a pair of shears is avoided. We hear of a new instrument, made in Germany, intended for such purposes, which is reported to be very complete, and to be furnished at a moderate price. It is said to weigh about two hundred pounds, and is thirty inches in length and in breadth.—9 *C*, *September*, 1870, 67.

FACILITATING THE DRYING OF PRINTERS' INK.

The addition of one per cent. of borate of manganese to printers' ink will, it is said, cause it to dry much more rapidly than usual.—13 *C*, *March* 15, 1870, 429.

PRINTING ON TIN.

A method of printing on tin is now used very largely for labeling boxes and other vessels, so as to avoid the necessity of affixing paper labels, which are so liable to come off. The colors adhere with such tenacity that the tin may be wrought

into any desired shape after the printing has been accomplished. The establishment where this printed tin is worked up also has a method of lining tin canisters with a solution of silica, which produces a coating favorable for the preservation of fruits or articles that contain acids.—3 *A*, *January* 27, 68.

HYDRO-EXTRACTOR.

An apparatus called the hydro-extractor has been devised for the purpose of separating liquid substances from any more solid matters with which they have been mixed, and is said to be especially applicable to the manipulation of liquid colors, such as are used in a printing-office. The arrangement in question consists of a cylinder, formed of fine brass wire, which is made to rotate within another cylinder of sheet-iron which terminates below in a kind of funnel. If the substance to be treated be introduced inside the sieve cylinder, and then made to revolve with considerable velocity, the finer and more liquid parts will be thrown out through the meshes of the gauze, and, striking against the outer cylinder, will trickle down and pass off through the funnel into any receptacle, the solid parts remaining behind. This process is extremely useful in the case of the colors just mentioned, which it is usually very difficult to strain. The principle involved is not by any means a new one, since it is employed in various branches of industry, but it is claimed to be especially convenient in preparing the liquid colors used in printing.—5 *C*, 1870, 503.

STEEL TYPE.

Some notice has already appeared of a recent French patent for making steel type, which, even if not likely to be practically useful, is yet sufficiently curious to make it a subject of interest to some of our readers. For this purpose a quadrangular wire, of the dimensions of the proposed type, is prepared, of very soft iron, and this is introduced into a machine which cuts it off at the proper length, and punches the letters in the end. The principal features of this machine are the arrangement for cutting off the proper lengths with perfect accuracy, and a stamp of hardened steel which has sunk into it the letters to be produced. After passing through

the machine, the letters are freed from the bur caused by the pressure of the stamp by means of a quickly rotating disc of steel, and are then converted into steel by cementation, making them of sufficient hardness not to require any further change. Letters thus produced are said to be sharper and more perfect than those of ordinary type-metal. One machine, driven with one-horse power, will, it is asserted, manufacture thirty-five thousand letters in twelve hours, the price of which is much less than that of the ordinary kind. The question still remains to be solved, however, whether these letters, in printing, will not cut through the paper, and be injuriously liable to rust.—6 *C, September* 22, 379.

WRITING-INK.

We have already presented to our readers numerous receipts for the manufacture of writing-ink, and we find still another among our exchanges, which, like all the rest, professes to be better than any thing else. How far this may be true can only be determined, of course, by proper experiment. This ink is prepared by digesting, for twenty-four hours, at a gentle heat, three thousand seven hundred and fifty grains of powdered nut-galls in a pint of alcohol of eighty-two per cent., and in another vessel one thousand three hundred and fifty grains of sulphate of iron, and the same quantity of gum arabic, with three pints of pure water. These two liquids, passed through a flannel strainer, are then to be mixed, and allowed to settle for eight days, and again strained. It is claimed that the ink thus obtained does not form any deposit, nor does it mould, and that it is more permanent than any other. It is said to become very black, and to maintain its intensity of color indefinitely.—2 *B, January* 22, 98.

REMOVAL OF INK BLOTCHES FROM WRITING.

When ink blotches have been formed over writing which it is desired to decipher, we are advised to brush off the spot carefully with a weak solution of oxalic acid by means of a camel's-hair pencil. In this way layer after layer of the superincumbent ink will be removed, and finally the writing itself will, in most cases, come to view. This is especially possible where some considerable interval has elapsed between the two applications of ink. As soon as the letters are vis-

ible, the brushing should be continued for a time with clean water, so as to arrest the tendency of the acid solution to make a further change in the ink.—8 *C, June* 23, 1870, 215.

SECRET WRITING.

In former times secret correspondence was conducted by writing with milk, diluted sulphuric acid, or a solution of cobalt, which, colorless under ordinary circumstances, becomes visible by heating the paper. At the present time, however, a very different class of fluids is used, especially the dilute saline solutions, which are known to the receiver of the letter alone. Without being specially skilled in chemistry, the receiver needs only to know the particular solution in which the paper has been moistened to have it in his power to bring the invisible characters to light. Thus, should the letter be written with a solution of sugar of lead, one of sulphide of potassium will have the desired effect. Or, if nitrate of silver be used, the paper must be dipped in a solution of ammonia. In either case a black letter is the result. Any colorless solution, however, which, when mixed with another equally colorless, produces a colored deposit, may be employed for this purpose. The number of substances therefore available is very great in the many possible combinations of the kind. The whole subject has recently received renewed attention in Germany and England since the introduction of the "correspondence cards," as it is hoped to secure the privacy of an ordinary letter by writing upon them with sympathetic ink.—15 *C*, XIV., 216.

PHOTOGRAPHING ON WOOD FOR ENGRAVING.

The use of photography in transferring a picture upon wood, as preliminary to the work of the wood engraver, is rapidly extending, although the best method of doing this is a secret confined to a few persons. One of the best ways of accomplishing the desired result is said to be indicated in the following statement, which we borrow from a London contemporary: The block on which the picture is to be made is first dampened with water, then whitened with enamel rubbed from the surface of good enameled visiting cards. Rub gently, removing only the enamel, after which brush the block smooth with a moderately stiff brush from right to left and

up and down, making a smooth, even, and very thin surface. Allow this to dry, after which it is to be flowed with a solution of albumen made with the white of one egg and sixteen ounces of water. When dry it may be coated with a second albumen solution. Take white of one egg, water four ounces, chloride of ammonia forty grains; beat the whole to a thick froth, allow to subside, then decant or filter through a fine sponge placed in a glass funnel. Pour a sufficient quantity on one corner of the block to cover it when spread around with the edge of a strip of glass. Let the surplus solution drain back into the bottle, and dry the film by a gentle heat. Now take of ether one ounce, alcohol one ounce, gun-cotton eight grains, nitrate of silver thirty grains, dissolved in as small a quantity of water as possible, and allowed to settle for a few days protected from the light. Flow the block of wood with this solution in the dark room, and dry by gentle heat. It is now ready for exposure under the negative. A porcelain printing-frame, or any other suitable method, may be used to print it. After printing dissolve off the film with ether and alcohol, assisted by rubbing gently with a soft sponge. The picture can now be toned and fixed in the ordinary way, or fixed and toned at one operation by the hypo and gold bath. After being allowed to dry it is ready for the engraver.—8 *A*, *August*, 1870, 146.

FIXING PENCIL OR CRAYON DRAWINGS.

A convenient method of fixing pencil or crayon drawings consists in moistening the opposite side of the sheet with a solution of bleached shellac in alcohol, care being taken not to have the solution either too concentrated or too thin, but such as will flow readily on the paper, making it transparent when moist, and leaving no spots behind on evaporation. In this way the drawings will, it is said, become permanently fixed, and may afterward be painted in water-colors so as to produce a very excellent effect.—13 *C*, *August* 11, 1870, 1140.

COPYING PICTURES BY COLLODION.

According to Mr. Kleffel, if a glass plate be coated with collodion in the ordinary manner, and, after the liquid has set, a piece of printed paper be pressed lightly upon the surface by the hand, a very exact reproduction of the letters or fig-

ures will be found impressed upon the collodion when the paper is removed, the design remaining perfectly visible after the complete drying of the film. It is suggested that this may be the germ of some important applications in the way of the reproduction of printed matter without injury to the original.—6 *A, June* 3, 686.

GLASS FOR PHOTOGRAPHING.

Photographers have long been aware that common glass is better adapted, as far as clearness is concerned, for receiving several successive negatives than mirror or plate glass, notwithstanding the difference in the evenness of the surface. This is said to be due to the fact that the speedy cooling of the surface of glass develops a very hard external skin or layer, the pores of which are extremely compact, this coating being removed in the process of grinding plate-glass. If a negative be made upon a plate of ground glass, and afterward apparently entirely removed, it will often happen that, in attempting to print from a second negative, the figures of the first one will be likewise reproduced, sometimes with remarkable clearness, although not the slightest trace may be visible to the eye. This accounts, in some, if not all cases, for the so-called "spirit photographs" which have occasionally perplexed, and even terrified operators. Common glass, on the contrary, by the compactness of its pores, resists the absorption of the silver, and permits the original picture to be entirely removed. It is found, too, that in many instances thin colored liquids will be absorbed in the surface of ground glass so that they can never be removed, a condition which does not occur with the common kind.

A glass is now prepared in Liverpool, according to the photographic journals, which is free from the defects in question. Although it is blown, yet this is done with very great care, and the surface is afterward very carefully and thoroughly polished by appropriate machinery without removing the external skin referred to.—6 *C, June* 1, 215.

TAPIOCA PAPER IN PHOTOGRAPHY.

A substance called tapioca paper—recommended as very useful in taking photographs by artificial light—is prepared by soaking 300 grains of tapioca for 2 days in an equal weight

of water, then adding a quart of water, and afterward, for every tenth of a quart of the liquid, 15 grains of iodide of potassium, 45 grains of chloride of potassium, and 1½ grains of bromide of potassium are to be introduced, and, when dissolved, the whole boiled for 10 minutes, allowed to stand for a day, and then decanted and filtered through linen. Twelve to 20 sheets of the paper are immersed in this liquid at a time, or can be floated upon it for 15 or 20 minutes, and then hung up to dry in a dark room. Should the paper assume a dark color it will be of no consequence, since this tint will disappear in the silver-bath. This bath is to be prepared in the proportion of 1 to 15, and for every ounce of nitrate of silver 50 to 60 grains of citric acid are to be added. The developer is made of 50 grains of pyrogallic acid and 80 grains of citric acid in 30 ounces of water. The time of exposure varies from 10 seconds to 25 minutes, according to the picture to be copied and the actinic force of the light.—8 *A*, *May* 1, 90.

SIMPLE METHOD OF COPYING DRAWINGS, ETC.

Silvered albumen paper, after being washed, may be conveniently used for copying negatives as well as positives. It keeps for weeks, and becomes sensitive to light only after exposure to the vapors of aqua ammonia, technically termed "smoking with ammonia." Dr. H. Vogel has greatly simplified the latter process by substituting for the liquid ammonia the powder of carbonate of ammonia. He thoroughly impregnates a piece of felt or cloth with this powder, and lays it under the silvered sheet, separated from it by a piece of blotting-paper. The negative is placed on the top, and the back covered, and the whole is ready for the copying frame. One impregnation with the carbonate of ammonia serves for several copies. So very simple is the operation that Dr. Vogel has made use of it in public libraries for copying complicated drawings. He places the silvered paper, with the substratum of carbonate of ammonia and the drawing on top, between two plates of glass, and, exposing it to the light of the window, obtains a copy quite distinct in all its details, while he himself may be occupied with reading or otherwise. The copy obtained is, of course, in white lines upon black ground. Such photographs merely require to be treated with

soda when intended for long preservation. They are generally, however, not designed to be kept a great while.—14 *C*, CXCIX., 1871, 331.

EDWARDS'S IMPROVEMENT OF THE ALBERTYPE PROCESS.

We have already referred to the importance of some of the later improvements for the reproduction of photographic pictures by carbon ink from the photograph itself, without the use of any of the salts of silver, the result being a much greater economy of time and cost, and an absolute permanency of the print. The more important of these methods are those known as the "Woodbury" and the "Albert" processes, and both have lately come extensively into use both in Europe and America, and are employed in the reproduction of plates for illustrated works. An English artist, Mr. Ernest Edwards, has, it appears, been improving upon the Albert process until he has succeeded in obtaining what he and others call the perfection of the art. This method, in its present manipulation, consists in coating evenly with wax the plate of glass, the surface of which has been ground, but not polished, and then pouring over it a sufficient quantity of a mixture of gelatine, bichromate of potash, and chrome alum, so as to form, when spread out and subsequently dried, a film of the thickness of a very thin card. The chrome alum is of great importance in preventing the subsequent solubility of the film, as it has the property of preventing the gelatine from again becoming liquid after it is set; and without the use of some such process it would be entirely impossible to carry on the work successfully. The usual proportion of bichromate of potash to the gelatine is about five per cent., although this varies for different applications.

After the glass has been coated it is maintained in a level position for a few minutes, until the film has set sufficiently to permit its being placed edgewise, and stored away in a suitable drying-room to dry—an operation which usually occupies about twenty-four hours. After this the film is removed from the glass, the operation being facilitated by the use of the substratum of wax. This constitutes one of the most important advances of the Edwards process over the Albert, for various reasons that it is not necessary here to adduce. The film is then to be subjected to the action of the

negative, and treated as in the Albert process, after which it is to be attached to a plate of zinc, which is accomplished by a special manipulation, and it is then ready to furnish impressions. These are obtained by treating as on a lithographic stone, namely, by sponging with water, removing the surplus, and then pressing over the surface of the plate a sheet of blotting-paper. The ink rollers are next passed over it, the ink adhering according to the action of the light. The advantage of using the zinc plates in printing instead of glass, as is found in the original Albert process, lies in the greater durability of the former, and the immunity from the danger of cracking. A very great pressure is necessary in this class of printing to bring out certain tints, and the glass plate, however thick, is apt to be fractured. It is stated that fifteen hundred uniformly good prints can be obtained from a single film; and, if a larger edition than this be required, it is a very easy matter to prepare a number of films at the same time, so as to have a sufficient supply for any purpose.—13 *C*, *February* 3, 1870, 37.

IMPROVED PHOTOGRAPHIC PROCESSES.

In a late number of *Nature* we find a concise summary of the most important advances in photographic processes for the last two or three years, in which it is stated that the great point arrived at is in dispensing almost entirely with the silver salts, the action of light upon the bichromates of potash and ammonia being substituted. This is considered a matter of great importance, as replacing a very transitory and uncertain method by one that is permanent, since, as is well known, the silver pictures of a comparatively late date sometimes become almost obliterated. Of the several novel methods referred to, the first is the so-called carbon process, as devised especially by Mr. J. W. Swan, and familiar to all photographers. The autotype process of Mr. Johnson is said to be essentially the same in principle. The most satisfactory methods, however, are those in which light is not required at all for the reproduction of successive impressions from the original negative, this being the case in the Albertype and other methods. The Woodbury process also is especially mentioned as being extremely simple, and, at the same time, perfect in its work. In this a thin sheet of gelatine is sensitized by im-

pregnation with a bichromate solution, and exposed to light under a negative. Subsequent immersion in warm water removes the soluble portion from the surface, and leaves a thin gelatine plate, upon which the image is represented in relief. This matrix is then hardened with alum, and placed, when dry, in a hydraulic press in contact with a plate of type-metal. Under extreme pressure, applied gradually, the type-metal takes the impression of the relief, and thus becomes actually an engraved plate, in which the darkest shadows are represented by the deepest hollows, the half-tones by slight undulations, while in the high lights there is no depression at all. For the purpose of printing copies, a little pool of gelatine ink is poured upon a sheet of white paper, and the metal plate is brought down upon the same with some pressure, all superfluous ink is at once pressed out, and after a few seconds (to allow the warm ink to cool) the plate is raised, and a beautifully shaded print is seen, in which the shadows and half-tones are formed by layers of ink of different thicknesses. As the matrix can be used in the preparation of several dozen of plates, all of which can be printed simultaneously by having a suitable number of operators, many copies of a given print can be printed daily without involving the use of light in any way. The reprints are so perfect and delicate as to be actually mistaken sometimes for silver prints, and are, at the same time, absolutely permanent. This method is, perhaps, better adapted to the reproduction of photographic prints in large editions than any other that has been devised, and can be applied with equal advantage to all branches of illustration. An establishment for carrying on the Woodbury process has lately been started in Philadelphia, under the direction of Mr. Garbutt, of Chicago, who, it is understood, has purchased the right to use this patent in the United States. The principal objection made to this method is that the prints require to be trimmed and mounted, instead of being made directly upon the plate-paper like a lithograph. The Albert process is also being worked in New York under the original patent. The Philadelphia *Photographic World* for January last contains a portrait of Mr. George W. Childs, printed by the Woodbury process, of which five thousand impressions were made from a single negative in twenty days.—12 *A, January* 5, 1871, 187.

RESTORING FADED PHOTOGRAPHS.

Our readers are well aware o the extent to which the ordinary photographic prints, made with nitrate of silver, are apt to fade with time, and the danger of entire obliteration that attends many of them. It has been, therefore, an object of extended experiment with many to devise some process by which the pictures can be brightened and the faded portion restored. These experiments are asserted to have been more successful at the Military Academy at Woolwich than elsewhere, and we are assured that a method has been devised which answers the purpose almost perfectly.

The pictures are, in the first place, thoroughly impregnated with wax, care being taken to remove all excess by hot ironing, subsequently rubbing the surface with a tuft of cotton. This operation itself deepens the contrasts of the picture, and brings out many minor details previously invisible, the yellowish-whites being rendered more transparent, while the half tones and shadows retain their brown, opaque character. This picture, thus prepared, is then used as a negative, a print being taken from it, many details of treatment and manipulation too technical for introduction here being required.—18 *A, January* 6, 364.

HEATING BY CIRCULATION OF PETROLEUM.

A new method of applying heat has recently been patented in England, and is now in use for working stone-ware pans, such as are required in certain pharmaceutical operations, by which any temperature between 100° and 700° Fahrenheit can be safely and easily obtained and maintained.

The principle in question is to cause heavy paraffine oil to circulate first through a coil of pipes in a furnace, and then through the jackets of the pans. The oil is carefully selected for the purpose from the heaviest of the petroleum products, and moved by its own convection. Heated in a close coil of pipe by a coke fire, it rises into an air-tight tank, from which it passes through pipes to the jackets of the different vessels to be heated, returning after it has done its work to the lowest part of the furnace-coil. A continuous circulation is thus maintained, similar to that which occurs in a hot-water apparatus for warming buildings. After leaving the tank

the oil passes through a pyrometer, by which its temperature is indicated, and by means of dampers, etc., to the fire, the heat can be regulated to any required point. The heating medium is turned on or off the jackets in the same manner as steam, and as the rate of flow can be checked or augmented at will, the temperature is perfectly under the control of the operator.

In the model which has been employed the pyrometer generally indicates from 600° to 700° Fahrenheit, while a saturated solution of chloride of calcium is maintained at the boiling point in a shallow stone-ware pan. No smell of oil is perceptible in the room, and it is stated that the same oil may be used for years without deterioration, or causing any deposit in the pipes. As contrasted with steam heat, the inventor claims for his process a saving of thirty per cent. in fuel. It is obvious that the large amount of heat necessary to convert water at 212° Fahrenheit into steam at 212° is hereby economized.—1 *A*, *June* 10, 265.

THE CENTRIFUGAL MACHINE,

similar to that used in American sugar refineries and laundries, is now successfully used in France to extract the juice of apples and grapes for the manufacture of cider and wine. The machine is represented as acting more rapidly than the ordinary press, and extracts more juice. Thus with grapes the machine will in two hours do more work than the press in seventeen, and the juice is all of the same quality, while by the old process only the first running will make wine of the best quality, as the remainder is injured by the contact with the skins and stalks. The same results are obtained in extracting the juice from apples. The motive power necessary to drive the apparatus, it is reported, is not large, as a three-horse engine will give a thousand turns a minute to an ordinary sized machine.

ALCOHOL FROM LICHENS.

The use of lichens and marine algæ as a substitute for grain in the preparation of spirits appears to be extending in Europe, especially in countries like Sweden and Norway, in which these plants abound, and in which the cereals are raised with difficulty. The general process consists in converting

the cellulose of the plant into glucose by boiling with from seven to ten per cent. of the weight of the mass of hydrochloric acid by the aid of steam. The acid is then saturated with chalk, and the saccharine matter brought to fermentation. Twenty pounds of the lichen will, it is asserted, yield five litres of spirit, containing fifty per cent. of alcohol.—1 *A*, *July* 8, 23.

FILTERING ALCOHOL.

The following method of filtering alcohol, or its solutions, is said to be very satisfactory, and is used extensively in Northern Germany, where it constitutes one of the secrets of the trade. Clean, unsized paper (Swedish filtering paper is the best) is to be torn into shreds and stirred into the liquid to be clarified. The whole is then to be strained through a flannel bag, when the resulting liquid will be found to possess the utmost clearness and limpidity. A filter may also be made by spreading thin paper-pulp evenly upon stretched flannel or woolen cloth. When dry, the cloth so coated will be found to give better results than the felts, etc., commonly employed as filters.—14 *C*, 1871, vi., 513.

PRESERVATION OF WINE BY TANNIN.

Among the various improvements in the manufacture of wine, the most important in many years past is that introduced by Pasteur, of heating it to a certain temperature, which is done for the purpose of destroying the fungus, the development of which in wine causes it to become turbid, and ultimately converts it into vinegar. This process, applied both to wine and to malt liquors, after having been bottled and well corked, has been carried into almost universal application, with a result of retaining the liquid in question, for an indefinite period of time, at the precise point at which it was when treated. In some instances, however, this process is not applicable, and especially where means are not at hand for doing the work on a suitable scale, and for securing that particular temperature which has been found to be most successful in accomplishing the object, and in such cases the process of Parent becomes of great value.

This consists in the addition of a small quantity of tannin or tannic acid to the wine, which, perhaps, acts in a similar

way, by destroying the vitality of the spores of the fungus, since a microscopic examination of wine known to contain these germs, within a few weeks after being treated with the tannin, has failed to detect the slightest trace. Indeed, wine which has already begun to change and become turbid can be restored to its primitive clearness, and with a great improvement in its taste. Care must be taken, however, to use only tannin which has been prepared from the constituents of the grape, since the slightest proportion of the extract of nut-gall, although accomplishing the general object of destroying the fungus, will impart a peculiar taste which never disappears.—5 *C*, xxv., 199.

CARBOLIC ACID IN TANNING.

A patent was not long since taken out in Paris for the application of carbolic acid as a preventive of putrefaction in the different branches of leather manufacture, a few thousandth parts of carbolic acid added to the liquids used in tanning preventing the rotting of the skin, it is said, during the process of preparation.—*November* 18, 1870, 1578.

USE OF CARBONIC ACID IN TANNING.

In the new tanning process of Mr. Polefroy, carbonic acid is employed for the purpose of facilitating the penetration of the tannin into the interior of the skins, and thus accelerating the working of the leather without deteriorating the quality of the product. After the removal of the hair, the skins are plunged into a bath of lime, the consequence being that, upon contact with the oak-bark, tannate of lime is formed, and the tannin penetrates as deeply as the lime has attacked; carbonic acid is then made to operate upon the lime, and an insoluble carbonate is the result, the precipitate being thrown down in the state of mud. The skin is then finished in another pit, and the whole process is completed much more quickly than usual.—8 *A*, *July*, 129.

LARGEST LEATHER BAND.

According to the Mechanics' Magazine, the largest leather machine bands made in England have just been manufactured for use in a mill in which a 40-horse power engine is employed. These bands are 120 feet long and 24 inches wide,

and are made from the best portions of English ox-hides, having 14 rows of stitching to bind the thicknesses together, with a series of rivets running through between the rows.—3 *A*, *March* 17, 128.

ARTIFICIAL SHAGREEN.

The substance known as shagreen, used in covering instrument cases, telescopes, sword-hilts, etc., has generally been supposed to be derived from the skins of sharks and rays. We are now informed that an imitation is made in Russia which can scarcely be distinguished from the original, and that this is prepared from the skins of horses or asses, soaked in water and scraped, and, while the skin is still soft, small seed, such as mustard or chenopodium, are imbedded in it, and the surface afterward shaved down. By dyeing with green, produced by the action of sal ammoniac or copper filings, and drying, the imitation in question is satisfactorily accomplished.—17 *A*.

COPYING THE GRAIN OF LEATHER.

The Mechanics' Magazine informs us that by a recent process a perfect electrotype copy of the grain of leather can now be produced, which may be used in imparting an exact imitation of the grain of morocco, seal, or other skins upon ordinary leather, so as to render them almost indistinguishable from the original. The deposit is attached to the mandril of an ordinary machine-roller, and, on passing the skin through this, the finest variation of the grain or modification of the surface, in imitation of the original, is produced. The operator takes any skin that may be desired, and supplies from it the means of preparing a fac simile of it.—3 *A*, *May* 12, 324.

DETERMINING TANNIN IN OAK BARK.

A method lately introduced by Loewenthal for determining the amount of tannin in oak bark is based upon the fact that tannin, in the presence of indigo, is decomposed by permanganate of potash in such a manner that, with the final disappearance of the blue color, the last trace of the tannin is also decomposed. For this inquiry the following liquids are needed: first, a solution of indigo carmine; second, a solution

of tannin; third, a solution of the chameleon mineral or permanganate of potash; and, fourth, a solution of oxalic acid. —18 *C, August* 2, 495.

CARBOLIC ACID FOR RUBBER HOSE.

An important addition to the many practical applications of carbolic acid has lately been made in the United States by using it in the preparation of rubber hose. It is well known that the durability of this article, where hemp or other vegetable fibre is used as a basis, is greatly impaired by the tendency to rot; and a patent has lately been taken out, and is being worked with much success, as we are informed, by which the introduction of carbolic acid during the process imparts much greater durability to the manufactured article. —*Scientific Review, February* 1, 30.

PLATINIZED MIRRORS.

Much interest has been excited by the new method of constructing mirrors, invented by Dodé, of France, in which the chloride of platinum is used as a basis. For this purpose the glass plate, after being cleaned, is set upright, and the metallizing liquid applied with a brush, first from above downward, then from right to left, and so on alternately until a perfectly uniform coating is laid on. The platinizing liquid is prepared by dissolving one thousand five hundred and fifty grains of very thin rolled platinum in aqua regia, and carefully evaporating the solution obtained in a sand-bath, and drying, so as to prevent the chloride of platinum from becoming decomposed. It is then spread out upon a glass muller, and rectified oil of lavender added, little by little, with continued rubbing. Care must be taken not to add the oil too quickly, as otherwise too great an increase of temperature may result, and thus destroy the preparation. After the addition of about fourteen times as much oil of lavender as of the platinum used, the mixture is to be placed in a porcelain dish, and allowed to remain perfectly quiet for fourteen days, after which the liquid is to be poured off and filtered. After six days more of rest the liquid is to be decanted, and should then show five degrees upon the acid gauge of Beaumé. To the quantity of platinum just mentioned about four hundred grains of litharge and as much of borate of lead are to be

added, the two substances being first rubbed up with one hundred and twenty to one hundred and fifty grains of oil of lavender, and then united as speedily as possible with the platinum liquid, after which it is ready for use, as mentioned. The coating of oil mixture thus applied is allowed to dry gradually, and the glass plate thus prepared is then to be introduced into a muffle of peculiar construction, in which the resinous substances are decomposed and converted into carbon, without melting or developing any bubbles, the remainder constituting a perfect platinum surface. Mirrors thus prepared have a high degree of lustre; and, as the reflection is from the anterior face, it is immaterial what the character of the glass is, provided the surface be perfectly smooth and free from striæ, or, indeed, whether it be transparent at all. This constitutes a great advantage over the ordinary method, where the transparency of the glass is an object of prime importance. Glass mirrors of this kind are translucent when held against the light, and may consequently be used to advantage in forming screens for windows of rooms, and inclosed spaces in offices and stores where it is desirable to be able to look out without difficulty, while at the same time concealed from the view of those on the other side. For this, however, it will be necessary that there be no window or other free opening opposite the plate-glass in question. It is said that the cost of platinum sufficient to prepare ten square feet of glass does not exceed twenty cents.—14 *C*, CXCV., 464.

FREEZING MIXTURES.

It is well known that there are certain so-called freezing mixtures which, by their solution in water, tend to produce a greater or less degree of cold, the most familiar illustration of the fact being seen in the application of salt to ice in freezing ice-cream or cooling Champagne—the ice melting, but the saline liquid indicating a temperature much below that of frozen water. There are other substances, however, the use of which produces a much greater degree of cold than that obtained by means of salt, the most conspicuous among these being finely pulverized crystallized nitrate of ammonia. If this be dissolved in an equal weight of cold water at 50° Fahr., a reduction of temperature to 3.20° Fahr. will result.

Again, if a mixture of seven parts of sal ammoniac, seven

of saltpetre, and eleven of Glauber's salt be dissolved in twenty-two parts of water at 50° Fahr., the column of a mercurial thermometer immersed in the mixture will fall to 4.10° Fahr., or nearly the same as the preceding reduction. This, therefore, may be considered as much superior to any other combination yet proposed for practical use in the production of a low degree of temperature. The nitrate of ammonia has, however, the advantage, even if more expensive, that it may be used over and over again, it being only necessary to evaporate the solution to the point of crystallization, while the mixture just referred to can only be used once.

In one instance, with the air at 60° Fahr., and the water at about 54°, a thick, cylindrical cup of very hard ice, about eight inches high and several lines thick, was produced in about fifteen minutes.

An interesting experiment bearing upon the same point may be made by melting together fifty-nine parts of tin, one hundred and three and a half of lead, and one hundred and eighty-three of bismuth. If this be finely rasped or powdered, and introduced into one hundred and eight parts, by weight, of quicksilver, we shall find that the thermometer immersed in the mixture will sink to 3.20° Fahr.; and water placed in a thin test-tube, and allowed to remain for a few minutes in this bath, will be completely frozen.—15 *C*, XIX., 301.

A NOVEL SPERM CANDLE

has recently been introduced in London. According to the description, four lateral apertures near the lower end of the candle communicate from the outside with internal longitudinal passages, so as to admit air. By this arrangement, it is claimed upward currents of air will be formed in the passages, which, issuing in close proximity to the flame, will produce more perfect combustion and increase the quantity of light given out by the candle. The longitudinal passages may either extend nearly up to the tip of the candle or may pass directly through it.

OBJECTIONS TO PRACTICAL USE OF OXYGEN IN ILLUMINATION.

We have referred on several occasions to the use of oxygen as an illuminator on a large scale, and to the many advan-

tages claimed for it by the inventors of the different processes. It is now stated, on the other hand, however, that the entire process of manufacture has many grave practical difficulties, especially in regard to the preservation and distribution of the gas, since iron reservoirs and pipes, especially when moistened, are so liable to be attacked by the oxygen as to be soon rendered useless, thus requiring some new material for this purpose. The illuminating apparatus also requires to be totally changed, and, unless the mixture of the oxygen is made with the greatest exactness, the idea of the economy of the illumination is illusory. Furthermore, the intensity of the light is very variable, according as the oxygen is more or less mixed with air and moisture. So far as it regards the economical introduction of this method of illumination, the ordinary gas companies are assured that they have nothing to fear from competition.—6 *C, July* 21, 292.

USE OF ZINC-ETHYL IN ILLUMINATION.

Various propositions have been made for increasing the illuminating power of common gas by the use of the liquid hydrocarbons, but their explosive character and other difficulties have interfered with their employment in practice. It is now proposed to try zinc-ethyl or chloro-chromic acid, a brilliancy of flame being thus obtained more than sufficient to compensate for the additional cost. If hydrogen be passed through a mixture of zinc-ethyl, it takes up a quantity of zinc mechanically, and burns with a brilliant flame. If chloro-chromic acid be substituted for the zinc-ethyl, some chromium is carried off with the oxygen, and the light is more brilliant than before, and is said to have at the same time powerful actinic properties.—8 *A, July*, 126.

PHILLIP CARBO-OXYGEN LAMP.

A new artificial light, known as the Phillip Carbo-oxygen Lamp, is said to possess many important advantages over the ordinary means of illumination, and bids fair to come, before long, into very general use, its advantages over all others consisting in its simplicity, its brilliancy, and the less noxious character of the products of combustion. The light is generated by the simultaneous combustion of a certain liquid chemical compound and of a current of oxygen, arrangements

for the purpose being constructed in a suitable lamp. The gas is derived from the atmosphere, either by chemical or mechanical means. The liquid consists of a hydrocarbon, which costs but little, burns economically, and can be employed only in this particular direction. The combustion is maintained in a lamp fitted with a wick, into the flame of which the oxygen penetrates in a horizontal direction. The flame is thus made to assume the form of a star, and any heating of the wick-holder is thereby prevented. The quantity of gas consumed is about $5\frac{1}{2}$ cubic feet per hour. Fed with air containing 53 per cent. of oxygen only, a light is obtained in this lamp equal in brilliancy to that from pure oxygen, and equivalent to ninety or one hundred candles, or ten times that of an ordinary gas jet. This lamp is said to possess the important quality of perfect security, no explosion being in any way possible. Among the applications of this lamp, it is stated to be extremely well adapted to photographic purposes.—1 *A*, 1870, *July* 8, 21.

HEATING CARS BY SAND.

An ingenious method of heating railway carriages in Sweden consists in the use of sand made hot in an oven and placed in a double casing of sheet-iron, the space between the inner and outer casing being filled with cork shavings. The advantages over the hot-water apparatus, and more especially over ordinary stoves, will readily suggest themselves to every one, particularly in view of the entire immunity against danger from fire in case of an accident. The sand retains its heat for a long time, and does not require changing for many hours. —3 *A*, *February* 4, 1870, 94.

NON-CONDUCTING HANDLES OF TEA-POTS.

The interposition of two non-conducting portions in the metallic handle of a tea-pot, as is well known, prevents a considerable degree of inconvenience in handling it when filled with boiling-hot liquid. Another method of accomplishing the same result, recently suggested, is based upon the absorption of the heat conducted toward the handle by a material having a large capacity for heat, and which, consequently, will take up the heat which the metal of the handle is able to conduct without being itself raised to a high temperature.

For this purpose the handle is to be made hollow, as heretofore, and affixed to the metal pot without the interposition of any non-metallic substance. It is then to be filled with water through a minute perforation made for the purpose, which can be done by heating the handle so as to expel some of the air, and then plunging it again into the water. A small quantity of water enters, which is again boiled until the air is expelled, and the handle again immersed until it is filled with water. When full the hole is soldered up, and thus permanently closed.—8 *A*, *September* 1, 172.

TOSSELLI METHOD OF COOLING LIQUIDS WITHOUT ICE.

M. Tosselli, of Paris, has devised a new method for cooling liquids without the use of ice, which he thinks can not fail to become of much practical importance. It consists essentially in a disk formed by a metallic tube folded in a spiral upon itself, one end of which remains open, and the other is in communication with a horizontal tube, which constitutes the axis of rotation, and passes through its centre. This disk, placed vertically, is plunged for half its diameter in water contained in a tank, and is made to rotate about once in a second. During this action the external surface of the disk is continually moistened by the water, and, consequently, a considerable degree of evaporation takes place. This evaporation abstracts from the tube a certain amount of heat; and since at each turn of the disk a quantity of water is introduced into the tube, this water gives up to the tube the heat which has been lost by the evaporation from the surface, and its temperature is correspondingly lowered, the water ultimately falling back again into the tank considerably colder than it was before. A modification of the arrangement consists in causing cold water from the centre of the tube to pass into a spiral worm in an adjacent tub, filled with the water which it is desired to cool. It will be understood, of course, that this cold water, passing continually through this worm, and brought back again into the first-mentioned tank, will carry with it the heat which is disengaged from the liquid in the tub to be dissipated upon the evaporating surface of the refrigerative disk. The amount of cooling effected by this apparatus depends, of course, upon the temperature of the air and the amount of its moisture. In one experiment, con-

ducted in the month of June, 1870, the temperature of the water in the tank at the beginning of the experiment was over 100° Fahrenheit, and in a short time was brought down to 66°—a difference of 34°.—1 *B*, 1870, 94.

ICE FROM THE TOSSELLI MACHINE.

Reference has already been made to the result of certain experiments upon the comparative durability of natural and artificial ice, resulting, somewhat to the surprise of most persons, in favor of the latter. Monsieur Tosselli, of Paris, now assures us that by his new method of congelation, in which the ice is obtained in a condition of stratification, a large block weighing about forty-five pounds, prepared in about eighteen minutes, on the 30th day of June, was forwarded, with very little care in packing, to Algiers, where it arrived at noon on the 5th of July, and had only lost half of its weight in that time—a resistance to melting many times greater than that of the ice from the Tellier machine, which had proved to be the most desirable in previous experiments.—3 *B*, *August* 25, 769.

COST OF ARTIFICIAL ICE.

In Dingler's Polytechnic Journal we find a careful comparison of the cost of the production of ice by means of the best-known machines for manufacturing it now in use in Europe. One of these—that of Carré—was found to be capable of producing forty-eight hundred weight of ice in twelve hours, at a cost of fourteen cents per hundred weight, while the expense of manufacturing the same quantity by the Windhausen machine amounted to nearly eighteen cents, thus showing a decided advantage in favor of the first-mentioned apparatus.—14 *C*, *January*, 1871, 40.

PHOSPHORUS MATCHES.

In a critical inquiry by Dr. Jettel in regard to the economical value of the different kinds of matches which have been proposed as substitutes for those containing phosphorus, so injurious to the health of the workmen who manufacture them, and dangerous to those who carelessly handle or swallow them, he comes to the conclusion that the proposed substitutes, as compared with phosphorus matches, are more diffi-

cult of ignition, and are not absolutely innocuous, but only less poisonous than the others. They absorb moisture more readily, which renders them still more difficult of ignition in damp seasons and localities. To the maker they are less satisfactory, as requiring much more care and expense in securing a uniformly successful result. Dr. Jettel therefore comes to the conclusion that a safe and harmless friction match, to contain no phosphorus, and to be equally serviceable with the phosphorus matches, is yet to be invented.—6 *C June* 1, 214.

ZINC GREEN.

An excellent quality of zinc green, it is said, can be prepared by stirring into a sufficient quantity of water five parts of oxide of zinc and one part of dry sulphate of cobalt. The solution is then to be dried and exposed to a red heat, which results in the production of a dark green powder. If we use ten parts of the oxide of zinc and one part of the salt of cobalt, the product is a dark grass-green color; with twice the percentage of the oxide of zinc it becomes a light grass green. Of the different tints the light grass green is the most esteemed, since it is well adapted to replace the dangerous Schweinfurt or arsenic green, and because it takes a good hold upon whitewash, which is not the case with the green cinnabar prepared by mixing together Berlin blue and chrome yellow. —5 *C*, XIV., 112.

FUSCIN, A NEW BROWN.

Fuscin, a new brown for dyeing wool and cotton, discovered by a Belgian colorist, is presented as likely to prove a permanent addition to the resources of the dyer, since its claims to regard are based not only on its being excellent in itself, but also procurable at a very low price. In using it 1200 grammes of fuscin, 1000 of water, and 1200 of hydrochloric acid, of 18° to 20°, are to be mixed together, with the addition of a few hundred more grammes of water if necessary. After the mixture has stood for half an hour, twenty-two litres of hot water are to be added, and the whole well stirred and decanted, and the liquid solution kept for use.

For coloring ten kilogrammes of wool there are to be used eighteen litres of the above solution, two kilogrammes of sul-

phate of soda, and enough water to dissolve the salt. The coloring matter is added, and heated to a little above a lukewarm temperature, when the fabric can be placed in the kettle, and kept there until the desired shade is obtained; it is then washed out in pure water. The sulphate of soda preserves the color without further change. If a slightly reddish tint be desired, about one kilogramme of alum is to be added to the bath.—5 *C*, xxxv., 278.

NICKEL AND ANILINE.

A patent has been taken out for the treatment of aniline colors by means of a salt of nickel. Green, purple, and a very fine black can, it is said, be obtained in this way, and used, under certain circumstances, to very great advantage. —25 *C*, *July* 16, 1871, 222.

ARTIFICIAL ALIZARINE.

The artificial alizarine made in Germany, it is stated, is exceedingly pure. It is about twenty-five per cent. stronger than mastic or madder of the same percentage of dry substance, while its color is much finer, purer, and more brilliant. It is furnished to the trade in the form of paste, containing ten per cent. of dry, fine coloring matter, without any other admixture. All the experiments made in printing and dyeing with this preparation establish the fact that the artificial alizarine answers all the expectations that were raised at the first announcement of its invention. For this reason it is likely to displace madder from the materials used by the dyer.—18 *C*, *November* 1, 1871, 703.

DETECTING ADULTERATION OF SILK GOODS.

An easy method of detecting adulterations of silk goods with other fibres consists in immersing a sample of the article in question in hydrochloric acid. This is an energetic solvent of silk, and removes it in a very short time, leaving the wool or cotton unaffected, at least for a considerable period. Another experiment to the same end consists in dropping a little of the acid on the sample, when, if pure silk, a hole will be made; if impure, the threads left will indicate the nature and extent of the adulteration.—6 *A*, *October* 28, 1871, 559.

ADULTERATION OF FUCHSINE.

An examination of certain specimens of commercial fuchsine, made by a chemist of Vienna, proved that it consisted mainly of coarsely powdered white sugar, superficially colored with a concentrated solution of fuchsine, in general appearance precisely similar to the genuine article. Attention was first called to this peculiarity from its insolubility in alcohol.—14 *C*, CC., 339.

YELLOW COLORING FOR SOAP.

The best substance for imparting a yellow color to toilet soap, according to Shering, consists of sulphide of cadmium, as not being affected either by light or by time. For this purpose cadmium yellow is to be rubbed up finely with some kind of oil and added to the melted soap, with continued stirring.—18 *C*, XXII., *May*, 1871, 352.

COLORING ARTIFICIAL FLOWERS.

A French chemist has suggested what he considers an excellent method for coloring artificial flowers. For this purpose he selects colors of different tints, soluble in water, and mixes them with a clean mucilaginous gum, and then pours this out upon highly polished square glass tablets of several inches in diameter. The layer must be put on uniformly, and the tablets exposed for a time to a well-heated stove. The gummy mucilage dries rapidly into a thin polished plate, which afterward separates from the glass and falls off. It may then be reduced to a powder possessing any required degree of fineness, the result obtained being remarkable for its permanency and transparency. The sheets obtained with aniline colors are considered especially beautiful. The tincture of curcuma, combined with a solution of soda, gives a beautiful chestnut; a solution of alcohol and curcuma with fuchsia, a beautiful scarlet red; and with aniline blue, a handsome greenish-yellow.—*Science pour Tous*, *Nov.* 30, 1870, 363.

HYDROFUGINE.

A substance called hydrofugine is recommended for the purpose of rendering fabrics water-proof, without interfering with the circulation of the air through them. The method

of preparing the compound is as follows: In one of two pans, each of a capacity of about five gallons, place twenty pounds of sulphate of alumina cut in thin slices; into the other pour eight pounds of oleic acid, and about a gallon and a half of alcohol. Stir in order to properly mix them, and then pour gradually the contents of the second pan into the first, stirring all the time with a wooden pallet for about twenty minutes. When the mixture is complete, allow it to settle for about twenty-four hours. The alcohol and the oleic acid, which floats on the top, can be poured off, and the precipitate is placed in a felt filter, and submitted to a strong pressure in order to obtain a solid cake. This cake is removed and dried in a moderately hot stove, and afterward reduced to powder. This powder is prepared for use for woolen fabrics by mixing and dissolving one pound in about twenty gallons of water. For silk, linen, and other fabrics, one and a half pounds of the powder will be required for every twenty gallons of water. The solutions are to be passed through a sieve before dipping the fabrics, which should be completely saturated and afterward removed and dried, when, it is asserted, they will be found to be impervious to water, but not to air.—18 *A*, *September* 29, 1871, 31.

RISE IN THE PRICE OF BICHROMATE OF POTASH.

The attention of dyers has been called to the recent increase in the cost of bichromate of potash, a substance now so much used for photographing and other technical purposes. We are informed that the price hitherto paid was abnormally low, compared with the cost of production, and it is stated that this was due to the competition between two Scottish firms engaged in its manufacture, who in their rivalry brought the price down to about ten cents a pound. Recently the demand has been greater than these two firms could meet, and the difficulties between them having been compromised, the price has already risen to double the sum mentioned, with a probability of being further increased. In this contingency, and in view of the great need of it at cheap rates, the establishment of manufactories in Germany is advocated, and it is thought that the chrome ores of Galicia can be used to good advantage in this connection. As the consumption in Berlin alone amounts to three hundred thousand pounds annually,

it is argued that, in the increased demand, there will be remunerative employment for several new establishments.—24 *C.*

SUBSTITUTE FOR BICHROMATE OF POTASH.

The recent increase in price of bichromate of potash continues to exercise the minds of manufacturers, especially in Germany, in view of the fact that it is obtained from chrome irons, which occur abundantly in various parts of the world, especially in Sweden; and this increase of price is considered to be the result of a combination on the part of the manufacturers, and not a real necessity.

The use of other substances is therefore urged, by which the demand for the bichromate of potash may be reduced, and its manufacturers thereby brought to terms. A writer in one of the German dyeing journals calls attention to the fact that for many purposes, such as for coloring black, Glauber's salt and sulphuric acid can be substituted to great advantage; and he gives the following recipe for dyeing one hundred pounds of loose wool, namely, six pounds of Glauber's salt, two pounds of sulphuric acid, and two pounds of blue vitriol, which are to be boiled together for an hour, and colored with forty to fifty pounds of logwood and one pound of blue vitriol, and finally colored black by means of a little green vitriol. The black thus obtained is pronounced to be beautiful, cheap, and easily spun, remaining loose and soft.—26 *C*, XVI., 125.

DYEING WITH IODINE GREEN.

According to a German chemist, the difficulty which has been experienced in dyeing with the new color, iodine green, results from the fact that the operation has been performed in metallic vessels, such as tin, copper, or brass, when, in reality, nothing but wood should have been employed. He communicates the following formula for using this color, which he thinks will be always found satisfactory: One part of purified soda water-glass (silicate of soda) is to be combined with six parts of water, and the wool well washed, and allowed to lie at a lukewarm temperature for three hours in the solution, due regard being had to the volume of the liquid. The wool is then to be wrung out and dried without rinsing. Liquid iodine green is then to be poured into the water,

enough to make a concentrated bath, and the dried wool is to be introduced and colored for an hour at a temperature of 133° Fahrenheit. After this is done the wool is to be transferred to a fresh bath, feebly acidulated, and left for a quarter of an hour. If the shade be yellowish, a little picric acid should be added to this acidulated bath.—23 *C, September* 1, 1871, XVII., 239.

OXIDIZED ANILINE BLACK.

In the Dyers' Gazette a receipt is given for an oxidized aniline black, of which several advantages are enumerated. The preparation is as follows: Take 309 grains of chlorate of potash, 463 grains of sulphate of copper, 247 grains of chloride of ammonium, and 617 grains of muriate of aniline, and dissolve these ingredients in two wine pints of water. This solution is to be heated to about 140° Fahr. in a water bath, and then removed. After from two to three minutes it commences swelling, and is apt to work over the edge of the vessel, at the same time emitting a vapor very injurious to respiration. If, after some hours, the pasty mass be not yet entirely black, it is again to be heated to 140° Fahr. with renewed precautions against its exhalations. Then for one or two days it is to be exposed to the open air, and thoroughly washed upon the filter. With about fifty per cent. of moisture it forms a paste of oxidized aniline black, which may immediately be used for printing, after being thickened with a considerable quantity of albumen. When perfectly dry this preparation appears as an intensely black, impalpable powder, without any lustre, which, with more or less gum, may serve as India ink, and even surpasses the genuine Chinese article in quality, as it certainly does in cheapness. Mixed with desiccating oils, it will be useful for painting, stamping, and marking linen.—18 *C*, 1871, XVIII., 288.

ALBUMEN FROM FISH EGGS.

The great demand for albumen for manufacturing purposes has led to the attempt to obtain it from every imaginable source, hens' eggs being of course the most simple, but at the same time the most expensive, and entirely insufficient to afford a supply. An experiment has recently been made by Dr. Grüne to utilize fish roes for this purpose, these being

obtainable from many kinds of fish in immense quantities, and which are usually thrown away. When entirely ripe, these roes are capable of furnishing a large amount of albumen, and in this condition are to be stripped from the investing membrane, and made free from adhesion as much as possible. They are then placed in a sieve, rubbed with a stiff brush so as to break up their contents and allow the albumen to pass through. This is to be washed with water, to which one part of ammonia in three hundred is to be added, so that the albumen adhering to the sieve shall be carried through. The solution thus obtained is then to be placed in high vessels and allowed to stand for some days, and when it becomes clear the albumen can be poured off into flat dishes, and evaporated in well ventilated rooms. The cleansing is said to be facilitated by passing through coarse sand or powdered glass. The best roe for this purpose is that of fresh-water fishes, such as pikes, but the albumen can be obtained from any species. If the roes have been kept too long, of course there is a tendency to decomposition, accompanied by an unpleasant smell, but this is not at all appreciable if the labor be prosecuted at the proper time.—13 *C, May* 15, 1871, 663.

IMPROVED MANUFACTURE OF GLUE.

Among industrial problems, that relating to the preparation of glue, especially in the moist, warm weather of summer, without its becoming acid or more or less putrid, is one of considerable moment, the greatest care and most continued precaution sometimes failing to secure a uniform and satisfactory result. A late paper by Prof. Fleck contains the following valuable hints on the subject:

It is well known that certain salts, and especially sulphate of ammonia, Epsom salts, Glauber's salts, hyposulphite of soda, zinc, iron, copper, and manganese vitriol, together with absolute alcohol, possess the property of separating glue from its solution. This depends not upon any acquired property of insolubility of the glue in water by such addition, but on a simple extraction of its water by the new substance.

If, now, sulphate of ammonia or hyposulphite of soda be dissolved in as small a quantity of water as possible, so as to form a concentrated solution, and this be added to a glue jelly melted over steam or warm water, stirring the mass

continually with a stick, the glue will immediately (when a sufficient quantity of the solution has been introduced) coagulate into an elastic mass, rubber-like when cold, which will keep indefinitely without spoiling.

If the glue thus prepared be now placed in pure water, it swells, and will be found after a few hours not only not to have lost its adhesive properties, but to have improved decidedly in this respect. And, again, if it be melted (still containing about 18 per cent. of moisture) with fresh glue-jelly having 90 per cent. of water, a half-soft glue will be obtained, easily soluble, and not spoiling readily. The saline solution from which the coagulated glue has been removed, on evaporation, will yield the salt in its original form, and capable of being used over again repeatedly.

To make a practical application of this principle on a large scale requires the use of a wooden box with low sides. The bottom of the box is to be sprinkled with a layer of sulphate of ammonia, Epsom or Glauber's salts, or hyposulphite of soda, about half an inch in depth, and a moist linen cloth laid over; upon this is to be placed a layer of glue-jelly, which is to be covered with a moist linen cloth; and thus the alternation is to be continued until the box is full, after which it is to be left for some hours, and the liquefied solution allowed to drain off through a hole in the bottom, the dropping ceasing in from twelve to eighteen hours. If, now, the upper cloth is taken off with its layer of salt, the glue will be found beneath it so far deprived of its moisture that, when placed in the sun or exposed to other heat, it will become completely dry in a short time without either melting or spoiling, and in winter may be laid upon drying floors with the same result. In this hint will be found the possibility of preparing glue throughout the year without the use of drying apartments or vacuum pans.

This method has its defects as well as its advantages. Among the former may be enumerated a slight want of transparency in consequence of the salt used in the process, and the taking up of from three to six per cent. of salt. The advantages, on the other hand, are in rendering the manufacture independent of climate, and capable of being prosecuted at any season of the year; and the fact that the salt employed can be used over and over again with scarcely any loss. The

sulphate of ammonia is furnished by gas-works; Glauber's salts and hyposulphite of soda by soda factories; while the various salt-works furnish Epsom salts. The action of each is about the same, though, perhaps, the Epsom salts yields the most transparent article.—14 *C*, CCI., 367.

FIRE-PROOF SOLUTION.

The use of the following solution is recommended as a method of rendering woven fabrics more or less incombustible: Three parts of borax and two and a half of sulphate of magnesia are to be mixed with twenty parts of water just before using, and the fabrics are first to be thoroughly impregnated with the solution, then wrung out, and washed after having become nearly dry. The use of a mixture of sulphate of ammonia and sulphate of lime is also recommended.

FIRE-PROOF MATERIAL.

A recent patent of a material for making fire-proof wearing apparel, paper, wood, etc., lately taken out by Carteron and Rimmel, depends for its principle on the exclusion of oxygen, thereby preventing the spread of the flame; so that, although the fire may actually consume the material which has become ignited, it can not be propagated or extended. The substance used in this new process consists of equal quantities of chloride of calcium and acetate of lime, which are treated in a particular way, and result in the formation of crystals which constitute the substance in question. These crystals are mixed with the paint, color, or varnish for coating wood, and with the starch used in starching fabrics of any kind. For paper, it is mixed with the size of the size-bath, or sprinkled on the sheet or web after the sizing.—18 *A*, *September* 15, 1871, 631.

BEST POWDER FOR POLISHING GLASS.

According to the London Engineer, the best powder for polishing glass or metals is probably that used by Lord Ross in preparing the mirror of his great telescope. This is prepared by extracting the peroxide of iron from a solution of pure sulphate of iron by precipitating it by means of ammonia. The deposit is washed, pressed until almost dry, and then brought to a dull red heat, just visible in the dark. The only points of importance are in reference to the purity of the

sulphate of iron, the use of ammonia in considerable excess, and the taking care not to allow the heat above that just indicated. The resulting powder should be a pale red, slightly tinged with yellow.

PURIFYING BENZOLE.

Professor Hoffman informs us benzole can be purified more readily than in any other way by first freezing it, and then subjecting it to pressure. For this purpose it is placed in a tin or brass vessel, in which an iron rod, having attached a close-fitting piston, perforated with numerous small holes, is made to play. On forcing this down, the liquid portions are separated and can be drawn off, and, on melting the frozen benzole, the hydrocarbon is obtained in a state of purity.—1 *C*, XXIII., 368.

FLUOR-ANILINE.

A substance, named fluor-aniline, has been discovered to possess fluorescent properties. It is obtained as a secondary product, with aniline red or aniline chloride of mercury. After triturating the mass resulting from this reaction, and adding a little water and washing it with ether, a solution of fluor-aniline is obtained, which is almost insoluble in cold, and but slightly so in warm water. It is soluble in hydrochloric, nitric, sulphuric, and acetic acids, and, combined with them, forms liquids equally fluorescent. In aniline red prepared with chloride of zinc there has also been discovered another substance similar to fluor-aniline, which presents a blue fluorescence.—1 *B*, *December*, 1871, 175.

IRON TANKS FOR WHALE-OIL.

The use of iron tanks of large dimensions for transporting petroleum from the oil wells to great distances was justly looked upon as one of the greatest improvements in the business, on account of the saving of expense in the way of casks, and the avoidance of danger in consequence of leakage. An ingenious firm in Cincinnati, Messrs. A. Gunnison and Co., have introduced this same feature into the transportation of lard-oil, and especially of whale-oil; and it is more than probable that in a very short time the cargoes of the whalers in the Pacific will be shipped at San Francisco in such tanks,

and brought across the country to the East.—*New York Shipping List, April* 15, 1871.

DETECTION OF FUSIL OIL.

The existence of fusil oil in alcoholic liquids can, it is said, be readily recognized by placing a portion in a glass tube, and shaking up in it a piece of iodide of potassium. Should there be even one fifth of one hundred per cent. of fusil oil contained in the liquid, a distinct light yellow color will be developed, the change taking place with still greater rapidity if the tube be heated.—18 *C*, XXII., *May*, 1871, 352.

UTILIZING OLD VULCANIZED RUBBER.

It is announced that a method has lately been devised by which old and refuse vulcanized rubber can be mixed with the fresh, in certain proportions, so as to convert the whole into one homogeneous and useful mass.—16 *A*, *July*, 1871, 410.

PURIFYING CARBONIC ACID GAS.

An excellent method of purifying carbonic acid gas, obtained from limestone, consists in conducting it through olive-oil, and an increase in the number of the points of contact with the out-streaming gas is effected by the introduction of pieces of pumice-stone.—18 *C*, XLII., 657.

FRENCH SILVER LAC.

This consists of very finely divided tin precipitated from its solution by means of zinc. Applied by means of some adhesive substance to wood, paper, and metals, it communicates to them a metallic silvery appearance.—5 *C*, 1871, 384.

ANTIDOTE TO CARBOLIC ACID.

A strong solution of saccharate of lime, it is asserted, is a thoroughly reliable antidote against the poison of carbolic acid, when by accident taken internally.—1 *A*, *November* 24, 1871, 252.

REMOVING THE ODOR OF CARBOLIC ACID.

The value of carbolic acid for many applications is now well established, but for medical purposes is greatly diminished by the odor, which is extremely offensive to many per-

sons. It may, therefore, be interesting to know of a method which, according to Professor Church, will entirely remove this odor, substituting for it a delicate trace of geranium leaves, which may, perhaps, be improved upon by adding a few drops of that oil. The process, as recently published by Mr. Church, consists in pouring one pound of the best carbolic acid of commerce (the white crystallized) into two gallons of cold distilled water, taking care not to permit the *whole* of the acid to enter into solution. With a good sample, if, after shaking repeatedly at intervals, between two and three ounces of the acid remains at the bottom of the vessel used, this will be a sufficient residue to hold and contain all the impurities; with bad samples, less water must be used, and more acid. The watery solution is to be siphoned off, and filtered, if necessary, through fine filter-paper till perfectly clear. It is then placed in a tall cylinder, and pure powdered common salt added, with constant agitation, till it no longer dissolves. On standing for a time, the greater part of the carbolic acid will be found floating as a yellow oily layer on the top of the saline liquor, and merely requires to be removed to be ready for use. As it contains five per cent. or more of water, it does not generally crystallize, but it may be made to do so by distilling it from a little lime. The portion collected, up to about 365° Fahr., has, at ordinary temperatures, scarcely any odor save a faint one resembling that of geranium leaves. The addition of about four drops per fluid ounce of the French oil of geranium will still further mask the slight odor of the acid, and has an additional advantage of liquefying the pure crystallized product. The pure acid may be dissolved in 230 parts of water and used as a gargle, or in 25 parts of water for painting the throat, or in 50 parts for the carbolic spray. —20 *A*, *October* 21, 1871, 502.

INTERMITTENT ELECTRIC LIGHT FOR SIGNALS.

Mr. Felix Lucas, a French engineer, proposes to obtain a very powerful electric light for coast service at a comparatively small cost, by making the light intermittent, with intervals of two seconds. By this means it is said that only one ten thousandth part of the electricity for a constant light will be required. A simple arrangement of clock-work causes the charcoal points to come in contact every two seconds,

and then separates them sharply, so as to break the current instantaneously. It is thought that this system will be found useful not only for piercing fogs at sea, but also for railway signals.

HOLMES'S INEXTINGUISHABLE SIGNAL-LAMP.

An inextinguishable and self-igniting signal-lamp lately invented by Holmes has some important peculiarities which render it likely to be of practical application under many circumstances, especially in view of the fact that it is self-igniting, that its flame can neither be extinguished by water nor other means, and that it is incapable of setting fire to objects, while, at the same time, its light is extremely brilliant and of long duration. The new lamp consists of a cylindrical vessel of tin with a conical point, and provided below with a tube six inches in length. The vessel is to be filled entirely with fragments of phosphide of calcium, and the tube soldered up air-tight, so that the preparation can be kept for many years without change. When the lamp is to be used the tip of the cone is to be cut off, and an opening made at the end of the narrow tube referred to, and the lamp inserted in a wooden float and thrown into the water. The water penetrates through the lower end of the tube and comes into contact with the phosphide of calcium, and is decomposed, with the formation of a phosphureted hydrogen gas, which is developed in great quantity, and which, escaping through the open tube of the cone, becomes ignited and burns in contact with the atmospheric air.

The phosphide of calcium can be prepared by heating pieces of chalk with amorphous phosphorus in a crucible to a white heat. At this temperature the chalk takes up the vaporized phosphorus, and combines with it to form the phosphide of calcium.

Another method of preparing this substance consists in heating small fragments of freshly-burned lime to a white heat in a Hessian crucible, and throwing upon it, from time to time, small dry pieces of phosphorus, covering up the crucible tightly immediately after each introduction of the phosphorus. The lime is changed into the "liver of phosphorus" (a mixture of phosphide of calcium and phosphate of lime), while a considerable quantity of phosphorus vapor is burned. The resultant substance is dark brown or almost black.

An experiment was lately made with this signal-light, in which the lamp was thrown overboard from a steamer, and drawn along behind, by means of a string, at a short distance from the stern. When the lamp touched the water a brilliant flame shot out immediately from the opening, and, although it was continually dragged under water by the motion of the vessel, the light remained unextinguished, even after the lamp was submerged. After a time the string was cut, and the lamp allowed to float behind, and it was visible for a long distance from the light disseminated around it.

PREPARATION OF HIDES.

The following method is recommended for preparing leather. Begin by soaking the skin or hide eight or nine days in water, then put it in lime; take it out, remove the hair by rubbing, and soak again in clear water until the lime is entirely out. Put one pound of alum to three of salt, dissolve in a vessel sufficiently large to hold the hide; soak the hide in it three or four days; take it out, let it get half dry, and then beat or rub until it becomes pliable. Leather prepared by this process will not do well for shoes, but answers for ham-strings, back-bands, and other purposes on the farm.—18 *A*, *November* 3, 1871, 184.

GREASING LEATHER.

In a recent article in a German journal it is stated that the idea that leather must be perfectly dry in order to take up grease or fat is entirely erroneous; the fact being, on the contrary, that wet leather can be much more readily saturated with these substances. This, it is said, is due to the fact that the pores of dry leather are almost completely closed, so that the absorption is very slow, while wet leather is expanded, flexible, and the pores wide open. When warm grease or oil is applied to leather in this condition, it is taken up superficially, and as the moisture evaporates the oily matter occupies the space vacated, and penetrates through the entire substance. For this reason it is that when wet leather is dried without any application, it often becomes brittle and unserviceable, a condition which is prevented by a previous coating of grease. The same writer advises very strongly to have the flesh side of the leather soles of boots and shoes outside.

This facilitates very greatly the application of grease for the preservation of the leather, since the pores are so much larger, and also permits the introduction of fine sands or iron filings, which increase the resistance to wearing. Furthermore, if the more compact portion of the leather be outside, when the outer layer is worn away it leaves the interior in a soft and tender state, which abrades very rapidly; whereas, if the soft side be first exposed, it may be protected as above mentioned, and when removed leaves a compact layer, even when worn down almost to the thinness of paper. It is also stated in the article quoted that the neck part of the skin of sole leather, contrary to the common opinion, forms the most durable soles for shoes, especially when the flesh side is exterior, and suitably saturated with wax or grease. The principal fault that this leather has is the slipperiness which it often acquires when worn on the grass. Shoe-soles prepared and treated in this way are not only more soft and flexible, but are said to be cooler in hot weather.—10 *C*, *June* 1, 1871, 73.

NEW PRESERVATIVE FLUID.

The following are the ingredients of a liquid by means of which the organs of the body that have become absolutely offensive from decay may be treated so that they can be examined for marks of injury or signs of disease. The fluid consists of a mixture of iodine one drachm, methylated ether (of specific gravity .720) ten fluid ounces, absolute alcohol one fluid ounce, and strong sulphuric acid four fluid drachms. The action of the solution seems to be that the iodine deodorizes, while the sulphuric acid engages the water and the alkaline products of decomposition, and produces the necessary firmness of structure. The ether escapes, being simply the fluid dissolvent for the other agents.—20 *A*, *December* 9, 1871, 701.

WALNUT DYE FOR WOOD.

A solution of equal parts of permanganate of potash and sulphate of magnesia, applied to whitewood by means of a brush, will produce an excellent brown color resembling that of the walnut. A second coating should be applied as soon as the first is dry.—6 *C*, XXVIII., 232.

IMITATION OF MAHOGANY.

A method of treating ordinary wood, so as to produce an almost undistinguishable imitation of mahogany, as practiced very extensively in France at the present time, consists in first planing the surface so as to render it perfectly smooth, and then rubbing it with diluted nitrous acid, which prepares it for the materials subsequently to be applied. Afterward, one ounce and a half of the gum called dragon's blood, dissolved in a pint of alcohol, and one third of that quantity of carbonate of soda, are to be mixed together and filtered, and the liquid in this state is to be rubbed, or, rather, laid upon the wood with a soft brush. This process is repeated with but little alteration, and in a very short interval afterward the wood assumes the external appearance of mahogany. When this application has been properly made the surface will resemble that of a mirror, and if the polish should become less brilliant, rubbing the wood with a little cold-drawn linseed oil will restore the former lustre.—18 *A*, *Nov.* 3, 1871, 165.

IMPROVED STAMPING INK.

An excellent red or blue stamping ink can be prepared by making a saturated solution of fuchsin, or sublime blue, with pure glycerine, and adding afterward, for the red color, madder cake, and ultramarine for the blue, thickening with enough dextrine to give the desired consistency. This color possesses all the peculiarities which are required for good stamping ink.—14 *C*, CCI., 278.

SIMPLE CONSTRUCTION OF CONCAVE AND CONVEX MIRRORS.

The German journals speak with approval of the invention of Nesmith, of Manchester, for the ready preparation of concave and convex mirrors, which usually constitutes an expensive and tedious branch of the glass manufacturer's art. For this purpose a flat plate of glass, about forty inches in diameter and three sixteenths of an inch thick, is first cemented to an iron mould, hollowed out hemispherically. By means of a tube attached to this mould all the air can be removed from the hollow space beneath the glass. The simple act of sucking away the air by means of the mouth will cause the disk to bend under the pressure of the external air, so as to

acquire a concavity in the middle of three fourths of an inch. If air be blown into the cavity, on the other hand, the plate becomes convex. It is expected that the process can be made so perfect as to render the convexity uniform for two plates, which, when cemented around by their edges, and filled with some strongly refracting liquid, will serve the purpose of a cheap and powerful lens. Indeed, an inventor in Baltimore has realized this expectation, and succeeded in producing lenses of great power and unusual cheapness.—6 *C*, *September* 28, 1871, 389.

AMMONIA ENGINES.

The Abbé Moigno claims for France the discovery of the applicability of ammoniacal gas as a motive power, and cites a communication of Tellier, the well-known inventor of the ice machine, to the Academy of Sciences at Paris, made some time ago. In this article it is stated that the availability of ammonia for the purpose consists, first, in its great solubility in water; second, in its ready liquefaction; third, in the faculty which it possesses of furnishing industrial pressure at the ordinary temperature; fourth, in the possibility of superheating its vapor without reaching too high a temperature; and, fifth, in the possibility of collecting the vapors expended by their solution in water, and then recovering them again, to be used anew in the operation. The more important applications of this gas, he thinks, will be in railroad traveling, for the purpose of working high grades, and as a motive power in tunnels, where smoke and burned air would not be desirable; also in mines, and in the minor industries, where a cheap and safe motive power is needed.—3 *B*, *Sept.* 14, 1871, 525.

TINNING METALS.

A bath can be prepared for coating any metallic substances with pure tin by dissolving ordinary tin in hydrochloric acid and precipitating the pure metal by means of an alkaline lye. The deposit is to be washed, and then introduced into a solution of cyanide of potassium or caustic potash. When completely dissolved, some hydrate of lime is to be added to the solution. Into this bath plates of tin and the articles to be coated are to be immersed, and the two connected in the ordinary manner.—13 *C*, *July* 1, 1871, 58.

ALLOY FOR JOINING BRASS TO IRON.

The difficulty of uniting iron to brass is created by the unequal rate of expansion in the two metals, which destroys the unity when the temperature is changed. There is an alloy of copper for which the inventor claims that its expansion by heat is so similar to that of iron and steel, that the surfaces may be regarded, when joined, as permanently united for all practical purposes. The formula is as follows: Tin, three parts; copper, thirty-nine and a half parts; and zinc, seven and a half parts.—18 *A*, *October* 13, 1871, 107.

PHOSPHORUS BRONZES.

A great advance has lately been made in the construction of bronzes by the addition of a small percentage of phosphorus, although the precise function of this substance has not been hitherto well understood. According to Levi and Kunzel, however, one cause of the inferiority in bronze consists in the constant presence of traces of tin in the state of an oxide, which acts mechanically by separating the molecules of the alloy, thus interposing a substance which in itself has no tenacity. The addition of phosphorus reduces this oxide, and renders the alloy much more perfect, improving its color, its tenacity, and all its physical properties. The grain of its fracture resembles more that of steel, its elasticity is much augmented, and its resistance to pressure sometimes more than doubled. Its durability is greater, and, when melted, it is of greater fluidity, and fills the mould in its finest details.—3 *B*, *September* 14, 1871, 602.

INTERNATIONAL EXPOSITION AT VIENNA IN 1873.

Arrangements are now making for an international exhibition at Vienna in 1873, one great feature of which will be the classification of the products of all countries in groups corresponding to their geographical positions. It is also expected that selections from the various museums of London, Paris, Berlin, Moscow, Lyons, Munich, etc., will be exhibited and compared, while it is also intended to represent a history of prices, a history of industry, and a history of natural productions, so that the world's progress in art, science, industry, and natural products will thus be brought in contrast. Dur-

ing the exhibition international congresses will be held for the discussion of important questions, to which either the exhibition itself may give rise, or for which it may furnish materials for illustration.—12 *A*, *September* 28, 1871, 434.

ARTIFICIAL GRINDSTONES.

A new application of the method of manufacturing artificial stone by the Ransom process, lately introduced, consists in substituting emery for sand, by means of which emery disks of great hardness are now constructed, which are doing excellent service in sharpening saws and other implements. —15 *A*, *November* 11, 1871, 628.

COLORING OF CEMENTS.

The ordinary coloring matters used in cements or plastering usually injure the setting power more or less, and fail to produce pure tints. According to a German chemist, however, cheap and permanent color washes may be made by mixing equal volumes of the dry pigment and burned and washed flint with milk of lime, a little water-glass being advantageously added. The tint produced is very agreeable, and, if stable mineral colors be used, as durable as the cement itself. Surfaces of great beauty are produced by finely powdered marble and flint, with the faintest tint of chrome green. The wash should be applied as soon as possible after the cement has set, and, if practicable, in one coat only; but, if two are necessary, the second must be made with the addition of water-glass. It is indispensable that the work be freely wetted for a week after laying on the color.—21 *A*, *June*, 1871, 451.

CEMENT FROM SOLUBLE GLASS.

A cement of great hardness, and of great applicability, it is reported, is made by mixing different bases with soluble glass. Combined with fine chalk and thoroughly stirred, it will produce a hard cement in the course of six or eight hours; with fine sulphide of antimony, a black mass is produced which can be polished with agate, and then possesses an excellent metallic lustre. Fine iron dust gives a gray-black cement. Zinc dust produces a gray mass exceedingly hard, with a brilliant metallic lustre, so that broken or defective zinc castings can be mended and restored. A white

cement of great beauty and hardness is obtained with soluble glass and chalk alone.—3 *A*, *July* 29, 1871, 70.

IMPROVED GLYCERINE CEMENT.

A cement of great value for many purposes, and capable of being used where resistance to both the action of water and to that of heat is required, is composed by mixing ordinary glycerine with dry litharge, so as to constitute a tough paste. For uniting the joints of steam pipes and other similar applications, this preparation is said to be very satisfactory.—1 *B*, *November* 12, 1871, 95.

TENACIOUS CEMENT.

A cement of great tenacity, and possessing the qualities of being colorless and transparent, and capable of fastening wood, paper, porcelain, glass, marble, alabaster, and stone, when not exposed either to moisture or a high degree of heat, is prepared by mixing together two parts of nitrate of lime, twenty-five of water, and twenty of powdered gum arabic, and rubbing them well together in a mortar. The nitrate of lime is prepared by placing small fragments of white marble in 25 per cent. of nitric acid, allowing a slight excess of the marble, then heating and filtering it. The solution contains $33\frac{1}{3}$ per cent. of the nitrate. In using this cement the fractured surfaces are simply to be united and held together by wrapping a cord tightly around them. The operation of drying is completed in from one to four days, according to the state of the atmosphere.—15 *C*, XIII., 304.

CEMENT TO RESIST SULPHURIC ACID.

A cement to resist sulphuric acid, it is reported, may be made by melting caoutchouc by a gentle heat, and adding from 6 to 8 per cent. of the weight of tallow, keeping the whole well stirred. Then mix in enough dry slacked lime to make the whole of the consistency of soft paste, and finally add 20 per cent. of red lead, whereby the mass, which would otherwise remain soft, becomes hard and dry. This cement, it is asserted, resists boiling sulphuric acid. A solution of caoutchouc in twice its weight of raw linseed oil, aided by heating, and the addition of an equal weight of pipe-clay, yields a plastic mass which also resists most acids.—1 *A*, *October* 20, 1871, 194.

M. MATERIA MEDICA, THERAPEUTICS, AND HYGIENE.

WATER KEPT SWEET BY THE IMMERSION OF IRON.

It is stated that if a piece of polished iron be immersed in water its surface becomes rusty, owing to the absorption of oxygen from the water. If, however, a second piece of iron be introduced after a time, this will not rust, and the water will be found to retain its sweetness and purity for a long time unchanged.—10 *C, January* 14, 12.

FUNGI IN POTABLE WATER.

Professor Frankland has lately been renewing the experiments of Dr. Heisch in regard to the development of fungi in drinking-water, in the course of which he found that when sugar is added to waters contaminated with sewage a fermentation ensues, with a rich growth of fungi. Meeting some unexpected exceptions, however, in the course of his investigations, to the result indicated above, he instituted a series of experiments, and finally deduced the following general results, according to the *Chemical News:*

1. Potable waters mixed with sewage, urine, albumen, and certain other matters, or brought into contact with animal charcoal, subsequently develop fungoid growths when small quantities of sugar are dissolved in them, and they are exposed to a summer atmosphere.

2. The germs of these organisms are present in the atmosphere, and every water contains them after momentary contact with the air.

3. The development of these germs can not take place without the presence of phosphoric acid, or a phosphate, or phosphorus in some form of combination. Water, however much contaminated, if free from phosphorus, does not produce them.—1 *A, February* 10, 68.

SEWAGE WATER.

Dr. Letheby continues his crusade against the use of sewage water for manure, maintaining, as he does, that it is a most prolific source of entozoa in man and the lower ani-

mals. He considers that in every instance of the occurrence of entozoa, whether in the form of trichina, hydatid, etc., the cause is directly traceable to the food we eat, the water we drink, or the air we breathe; and that it is probable that the majority of cases originate from the first two causes. He therefore urges that sewage matter should first be precipitated and collected in the solid mass before being applied as a fertilizer, thereby permitting the water thus purified to escape into the ordinary drainage of the country, without involving the terrible consequences referred to above.—20 *A, March* 4, 253.

PURIFICATION OF GYPSUM WATERS.

The water of many springs and streams, otherwise comparatively useful, is found to contain so large a percentage of gypsum as to render it unfit for ordinary purposes. Dr. Reinsch informs us that if finely ground witherite, or native carbonate of baryta, be added to the water in the proportion of about half a pound to forty gallons, and the whole well stirred together and allowed to settle, the superincumbent water will be found entirely free from gypsum, and to contain only a slight percentage of carbonate of lime, which, as is well known, when in a moderate quantity, is rather beneficial than otherwise to the health.—8 *C, June* 23, 1870, 197.

TYNDALL ON THE PURITY OF WATER.

Our readers will remember the interest excited by a lecture given by Professor Tyndall before the Royal Institution upon Dust and Disease, in which he presented some startling facts as to the impurity of the atmosphere, and made some important suggestions as to the method of improving the quality of the air we breathe.

The Professor has lately delivered a lecture upon the color of water, and the scattering of light in water and in air, which will probably be of equal practical value with that first referred to. His subject was illustrated, as before, by passing a beam of light through the liquid in a darkened room, by means of which the existence of the minute particles of impurities can be readily detected.

Lately engaged as one of the savans of the eclipse expedition, he embraced the opportunity to gather samples of wa-

ter in various localities and at different depths, and these were secured and sealed up with the utmost care, so as to avoid the possibility of the introduction of any additional impurities. In the case of all the specimens of water obtained within a few miles of the shore, the beam of light revealed more or less impurity, and it was only in the indigo water of the sea (as distinguished from the green) that he found a decided reduction of the amount of foreign ingredients. He assures us that the prevalence of one or the other of these tints in sea-water is always expressive of a greater or less degree of purity, as depending upon suspended matter. He advises the use of an experiment similar to that referred to for determining the purity of water of any kind, especially that used for drinking, as, notwithstanding a careful filtering through porous paper, and even through a charcoal filter, there may be left in suspension matter almost too fine for detection by the microscope, and yet clearly indicated by the beam of light.

He stated in his lecture that the purest water that he was able to find was obtained by melting a block of pure ice, but that even this required extreme caution to insure success. He called attention to the remarkable purity of the water from the chalk districts of England, and remarked that, but for the hardness of the water, or the amount of carbonate of lime held in solution, it would be the most desirable for drinking and other purposes. He said, however, that at Canterbury and elsewhere the water is subjected to a special preparation that causes a deposit of the lime. This is accomplished by adding clear prepared lime-water to the chalk-water, thereby causing a precipitate of carbonate of lime to the bottom of the reservoir. By this means the percentage of this salt in the water is reduced from 17 to 3, leaving a water of extraordinary beauty and purity.—3 *A*, *June* 27, 60.

HARD WATER *versus* SOFT.

The curious proposition has recently been enunciated by Dr. Letheby, of London, that moderately hard water is better suited for drinking than that which is soft. He states that a larger percentage of French conscripts are rejected from soft-water districts than from neighborhoods supplied with hard water, and also that English towns with water of more

than ten degrees of hardness have a mortality of four per thousand less than those whose inhabitants use softer water. This assertion, so contrary to the usual theory in the matter, is, as might be expected, sharply contested by other sanitarians, and the final result of the controversy will be looked for with much interest by the general public.—6 *A*, *March* 5, 303.

HARD WATER *versus* SOFT.

Dr. Letheby, at a recent meeting of the medical officers of health of Great Britain, took occasion to renew his statement, already referred to in our pages, of the superiority, in a sanitary point of view, of a hard-water supply to towns over that of soft water. Basing his arguments first upon physiological considerations, he maintained that the earthy matters in the hard waters were essential for the construction of the osseous tissues, and that they supplied much of the calcareous salts necessary for the nutrition of the frame, and that, by repudiating their use, we should be throwing away one provision of nature for this purpose. No one could say that a hard water was not far more agreeable to drink than a soft water. He maintained, in the second place, that the finest specimens of the English race were to be found in regions where the waters were hard, from flowing out of, or over calcareous strata. The same was the case with cattle and horses; witness those reared in such counties as Durham and Leicester, and the horses of Flanders, while the Shetlands only produced a race of ponies. But his principal argument was that, on classifying the towns of England, so far as their water-supply was known, according to the degrees of hardness of the waters, the average of the death-rate was least in those towns supplied with hard water, and increased as the waters became softer and softer, until it was highest in those where the water supplied was most soft. These statements, however, were met with much vigor by several speakers, among the most eminent of whom was Mr. Wanklyn, who endeavored to show that the deductions of Dr. Letheby were based upon incorrect premises, and that the case was very far from being proved.—20 *A*, *May* 27, 605.

DANGER FROM USING THE WASTE GAS OF FURNACES.

Attention has just been called by Dr. Percy, an eminent metallurgist, to the danger of using waste gas from the blast furnace. A principal ingredient of this gas, as is well known, consists of carbonic oxide, the inhalation of which in very small quantities, whether pure or mixed with air, is sufficient to destroy life. The employment of the waste gas of blast furnaces for heating steam-boilers, etc., is extending daily, and Dr. Percy fears that deaths from its inhalation may become frequent, unless those who use it are fully aware of its physiological action. Numerous cases of poisoning of this kind are already on record.—6 *A*, *July* 16, 1870, 80.

CONSUMPTION OF NOXIOUS GASES.

In nothing has the truth of the adage, "Where there is a will there is a way," been more clearly manifested than in regard to the consumption of smoke and noxious products in manufactories, especially where these were discharged into the water or the air, polluting the former, and often injuring health in the latter, or at least causing great annoyance to persons in the neighborhood. We are all aware of the effect of the law passed by the British Parliament, requiring factories to consume their own smoke, and giving a certain number of months in which to make the necessary arrangements for the purpose—the allotted time, on its arrival, finding many of the establishments in a condition to fully obey the law.

More difficulty was experienced in regard to the arrest of noxious gases, although this problem has in many cases been solved, and the waste products converted into a source of revenue instead of being a direct loss. Quite recently the subject of the gases produced in locomotive engines has occupied the attention of humanitarians, especially from their action upon the system when passing through underground tunnels, the surplus carbonic gases evolved being not only extremely disagreeable, but exciting a very irritating effect upon the mucous membrane of the eyes and nose. It has been lately suggested as a satisfactory method of accomplishing this object to make use of certain metallic oxides, either in solution or otherwise, with which the gases in question are brought into contact, and are thereby absorbed or decom-

posed. Caustic soda, among other substances, is said to be best adapted to the purpose. A solution of the soda is made, and lumps of coke moistened with it, which are then placed in vessels so arranged that the smoke of the furnaces passes through them, and the gases, in their passage, enter immediately into combination with the soda, forming a carbonate and sulphite.—16 *A*, *July*, 331.

INHALATION OF DUST BY WORKMEN.

The injurious effect of exposure to the dust of various manufacturing establishments has not unfrequently been dwelt upon with more or less force, but we are hardly prepared for the result of certain specific investigations on this subject. It has long been a disputed point whether the particles of iron, silica, etc., merely lodge within the air-cells of the lungs, or penetrate through their walls into the tissue before them. But Professor Zenker informs us that, on examining the lung of a woman who had been exposed to the dust of iron oxide, used in preparing books of gold leaf, he found the powder in the tissue between the air-cells and in their walls, as well as in their cavities. From less than two ounces of this lung over twelve grains of iron oxide were obtained by chemical methods; so that, if equally distributed through both lungs, there must have been at least three quarters of an ounce inhaled. In another case—that of a workman exposed to the dust of a mixture used in preparing ultramarine substances—he found a quantity estimated at fully an ounce.—21 *A*, *June*, 424.

DUST AS A FERMENT.

The lectures by Professor Tyndall upon atmospheric dust have stimulated much research on that and kindred subjects, and they have been very productive of good in the attention that has been drawn to the relationships of dust to the conditions of health and disease. In a late paper Mr. Tichborne furnishes some suggestions in regard to dust and ferment, and gives the result of numerous experiments with atmospheric dust taken from the bed of the street-way in Dublin, the gallery and upper seats of certain theatres, the top of Nelson's Pillar, at a height of one hundred and thirty-four feet, and other localities. He found that from one third to

one half of such dust consisted of organic matter, this being the case from whatever place it was taken. He details the result of experiments in regard to the power of this dust as a ferment, the process being based upon the reduction of the nitrate of any base to a nitrite, in the presence of substances undergoing fermentation. Due precautions were taken against error in every instance, and it was found that dust possessed the power of an active ferment; and, furthermore, that the dust taken from a great height, as that from Nelson's Pillar, appeared to have as great or greater activity than that from a building quite crowded to suffocation, this being due, probably, to the extreme lightness of the spores, almost approaching to volatility.—1 *A, October* 21, 197.

TYNDALL'S RESPIRATORS.

Professor Tyndall, in continuation of valuable applications of the highest principles of science to questions of practical moment bearing upon health and domestic economy, has lately given a lecture before the Royal Institution upon the influence of dust and smoke. In this he renewed the suggestions already made by him on a previous occasion as to the value of the so-called respirators in excluding dust and other noxious substances from the lungs. Such a respirator, in its simplest form, consists of a small wad of raw cotton, which is either to be taken into the mouth or bound over it. By this simple application exhalations and emanations produced in many branches of labor, such as grinding metals, spinning, winnowing grain, etc., and including smoke and certain gases, may be almost entirely arrested and rendered harmless. If the cotton be moistened with a little glycerine, its serviceable properties are materially increased—so much so that it is possible to remain in quite dense smoke for a number of minutes without inconvenience.

Respirators of a more complicated character were suggested by Professor Tyndall in his lecture, to consist of a vessel containing layers of cotton, charcoal, and slacked lime, provided with an aperture for the mouth, and so arranged that the air can be first drawn through the apparatus, and then discharged from the lungs by a side aperture, and without passing again through the packing. In this way he obviates the evil of having the cotton, etc., saturated with the moist-

ure and animal matter from the lungs, thereby rendering it foul and offensive in a short time. By means of the charcoal all decomposing animal vapors are completely absorbed, while the lime also answers the purpose of arresting and condensing acid exhalations, especially those of carbonic acid, hydrochloric acid, etc. In conclusion, the lecturer remarked that the subject of respirators for the use of firemen was one that had been brought into practical application, the London Fire Brigade having been provided with a certain kind, by means of which they were able to go into a room filled with stifling smoke and remain there for any length of time without the slightest inconvenience.—12 *A*, *June* 15, 124.

OPPOSITION TO TYNDALL'S THEORY OF DISEASE.

In a previous number we have given an abstract of certain views of Professor Tyndall in regard to the germ theory of disease. These, however, have not passed unchallenged by very eminent medical authority, and a late number of the British Medical Journal contains a sharp article on the subject. After taking up the different points of Professor Tyndall's theory in regular order, the Journal sums up by stating that the tendency of modern research is not as favorable as Professor Tyndall believes it to be respecting the theory of the parasitical origin of contagious diseases, and that the predominance of belief is to the opposite view; also, that the theory of the permanency of unrelated, individual, or zymotic types is not an undisputed or unquestioned theory.—12 *A*, *June* 29, 165.

VENTILATING ROOMS.

An ingenious and elegant arrangement for ventilating rooms consists in inserting in one of the windows a pane of glass having four round holes cut into it. Upon this pane a second round plate, having also four round holes of the same size, is so attached that it may be easily made to rotate in close contact. To admit fresh air, the rotating disk is turned so that both sets of openings coincide; to reduce the amount, or to exclude it, it is only necessary to make a slight turn of the plate.—15 *C*, XXIII., 368.

PHYSIOLOGY OF MUSQUITO CURTAINS.

A suggestion that musquito curtains in tropical countries, besides keeping off these pests, also serve as screens against miasma, has elicited various corroborating statements from travelers and others; and we find in a recent number of *Nature* an indorsement by Mr. E. L. Layard, the eminent naturalist of South Africa, as to a beneficial action in this direction. He finds that even so slight an obstruction as the fibre of the net causes a great difference in the temperature between the interior and exterior air, this difference amounting in some instances to eight degrees, the increased temperature of the inside tending to dissipate the malaria, and prevent the cold and damp of the tropical night from acting upon the system when relaxed in sleep, and with the pores of the skin wide open.—12 *A*, *June* 23, 143.

BALESTRA ON THE MIASM OF THE PONTINE MARSHES.

Mr. Balestra, in a series of investigations upon the nature and origin of the miasma of the Pontine Marshes, found the stagnant waters filled with organisms of various species, and among them one in particular, which was abundant in proportion to the degree of putrefaction in the water. This is a small alga, which floats on the surface of the water, and presents the appearance of drops of oil. At a low temperature these germinate very slowly; but during the warm weather, and when exposed to the air, they reproduce very rapidly. The author, finding that the addition of a small quantity of arsenious acid, or sulphite of soda, or, still better, of the neutral sulphate of quinine, destroyed the vitality of this plant, infers that the miasma of the marshes is due to its existence and propagation, and that the well-known agency of these medicaments in curing fever depends upon their chemical action upon the plant which causes it, especially as its spores are found to be disseminated every where through the atmosphere. The plant is not developed in a dry season, although it makes its appearance in great quantity during moderately rainy weather occurring in a warm season. The non-occurrence of the fever in the winter, according to the author, is due less to the cold, which prevents the vegetation of the plant or retards the decomposition of organic sub-

stances, than to the abundance of the rain, which covers the places where these spores exist, their dissemination into the atmosphere being thereby prevented, and only facilitated by the drying up of the soil, which allows the spores to float readily.—1 *B*, *August* 20, 245.

FUNGUS THEORY OF DISEASE.

The cause of the so-called infectious diseases has always been an unsolved problem in medical science, and whether it be miasma or contagion, or both, is yet an undecided question. Indeed, the disputants differ as to whether contagion itself is purely chemical in its nature or organic—that is, of animal or vegetable origin. The latter opinion is at present supported by many eminent physicians, and the idea that the spreading of such diseases as cholera, typhus, small-pox, etc., is due to specific fungi, the minute spores of which propagate within the animal organism, has been received with great favor.

Professor Grohe, of Greifswald, assisted by Dr. Black, has instituted a series of apparently decisive experiments on this subject, and they have come to the conclusion that the theory of the vegetable nature of infection has not yet been fully demonstrated. Two species of parasitic fungi, *Aspergillus glaucus* and *Penicillum glaucum*, were, after suitable preparation, introduced into different organs of living animals, such as rabbits, dogs, sheep, etc., and from a critical examination of their action the following facts were ascertained:

1. The spores of some fungi develop into *mycelia* within the animal organism.

2. This development occurs not only with spores brought directly into the circulation, but these will also be taken up when introduced into the abdominal cavity.

3. The *mycelia* thus developed from the spores are the same in all the organs, and only differ in their terminal ramifications from those grown otherwise.

4. *Aspergillus* and *Penicillum* have, in the tissues, the same form.

5. The most extensive pathological alterations, which occasion the destruction of the organism, are induced by the vegetation of fungi.

6. Spores taken up into the circulation from the abdominal

cavity produce most intense pathological effects, but finally disappear entirely, and without leaving a trace, whenever the organism does not succumb.—*Inaugural Disc. of Dr. Black, Stettin*, 1870.

TEMPERATURE REQUIRED TO KILL MICROSCOPIC ORGANISMS.

The discussion of experiments made in regard to spontaneous generation has proceeded upon the assumed basis that live germs are destroyed by exposure to a heat of 212°, or that of boiling water. Suspecting that this might not be true in all cases, Mr. Crace Calvert has lately instituted a series of investigations on the subject. Different substances were employed by him, particularly such as have generally formed the basis of experiments—namely, solutions of sugar, infusion of hay, solutions of gelatine, and water that has been in contact with putrid meat. Small tubes were selected of very thick and well-annealed glass, each tube about four centimetres long and five millimetres in diameter of bore. The substances to be operated upon were introduced into them, and left exposed to the atmosphere long enough for the germ life to be developed. Each tube was afterward hermetically sealed, and wrapped in wire-gauze to prevent any accident to the operator in case of the bursting of the tube. They were then placed in oil baths, and gradually heated to the required temperature for half an hour. Without going into the details of experiment, we may mention, as the general result, that protoplasmic life was found to be only slightly affected by a temperature of 212°, and that even at 300° it is not entirely destroyed, except in the case of gelatine. In another case the temperature of 400° Fahr. was required to destroy life.

These experiments, therefore, show that the life found by previous experimenters in boiled liquid was not due to spontaneous generation, but to life which had remained in the fluids, as in none of the experiments on record, as made by the advocates of the spontaneous generation theory, was heat raised above a temperature of 300°.

Proceeding to the other extreme of temperature, Mr. Calvert subjected some putrid meat liquor, containing a large quantity of animalcules, for twenty hours to a temperature ranging between that of the freezing point of water to 17°

below it. When the ice was melted animalcules were found to have maintained their vitality, and in two hours they resumed their original activity. This corroborates the experiments of Professor Melsens, who ascertained that the most intense cold does not destroy the active power of vaccine lymph. —1 *A*, XXIV., *July* 28, 37.

SANITARY CONDITIONS OF CERTAIN GEOLOGICAL FORMATIONS.

Dr. Moffatt, in discussing the relation of health to certain geological formations at the late meeting of the British Association, remarked that the district in which he lived consisted geologically of the carboniferous and of the new red sandstone system; that the inhabitants of the former were engaged in mining and agriculture, and those of the latter in agriculture chiefly. Anæmia, with goître, was very prevalent among persons living on the carboniferous system, while it was almost unknown among those on the new red sandstone; and phthisis was also more prevalent among the former than the latter. He then gave some statistics as to the diseases prevalent in the counties of Chester, Flint, and Denbigh, and stated that the practical deductions to be drawn from the inquiry were that all young persons living on a carboniferous formation, having symptoms of incipient goître and anæmia, ought to be moved to a soil of red sandstone, and persons of strumous habit ought to reside upon sandstone at an elevation of at least 800 to 1000 feet above the sea.

In the discussion which followed the reading of this paper, Mr. G. A. Latour mentioned a carboniferous district in Northumberland containing a thin bed of limestone, where the people suffered from goître. Sir Richard Griffith remarked that goître was unknown in Ireland, although they had plenty of carboniferous rocks. Professor Hall agreed with Dr. Moffatt respecting the healthful character of the new red sandstone. —12 *A*, *August* 24, 332.

WATERING STREETS WITH SALINE SOLUTIONS.

The subject of watering the streets of cities with saline solutions, which, by their hygrometric properties, shall reduce the amount of evaporation, and consequently the frequency of application, is one that has excited much interest; and

while the earlier experiments were rather unsatisfactory, later experiences have been more favorable. Quite recently the subject has been investigated in Hamburg, where 2500 pounds of water were combined with 125 pounds of chloride of calcium and 125 pounds of common salt; and this was distributed carefully in two applications over a surface of 1500 square yards, so as to make the entire surface moist. The first result was simply a positive inky smell, unaccompanied by the development of any saline crust, such as had been noticed previously. As a question of economy, it was found that the cost of this amount of saline material for one application was at least thirty times as great as one of pure water; or, in other words, thirty waterings with pure water could be made at the same expense. In reference to the use of ordinary sea-water for streets, it is thought that this is advantageous only where it is cheaper than fresh water, the development of an unpleasant smell being quite marked in most cases. The city of Newport, Rhode Island, is watered by contract with sea-water, and it is said that the odor rising from the streets thus watered is sometimes almost insupportable.—14 *C*, CCI., 86.

WHEAT *versus* FLOUR.

In Dr. Moffatt's paper on "Geological Systems and Endemic Disease," before the British Association, after pointing out that anæmia, goître, and phthisis were more prevalent among the inhabitants of the carboniferous districts than among those living on the new red sandstone, he stated that analysis showed that the wheat grown upon the carboniferous system was deficient in phosphates or nutritive salts; and that a man who consumed a pound of Cheshire wheat per day took in nine grains more of phosphoric acid than one who took a pound of wheat grown upon the carboniferous system. The deficiency also of the nutritive salts in the bread compared with those in the wheat was very remarkable, and it was no doubt owing to the removal of the bran from the flour with which the bread was made. Medical men, he said, could not too much impress upon the minds of the public the importance of using flour made from the whole of the wheat, or "whole grain." Professor Church, of Cirencester, has lately found in entire wheat 2.12 per cent. of ni-

trogen, equivalent to 13.40 per cent. of albuminoids, or flesh formers.—18 *A*, *August* 25, 562.

TESTING ADULTERATION OF MILK.

In a recent report by Professor Chandler, of Columbia College, upon the quality of the milk supply of New York, it is stated, as the result of numerous experiments made in his official capacity as chemist to the Board of Health, that the milk used is generally free from injurious adulteration and untainted with disease, but mixed with water in the proportion of one quart to every three quarts of milk. The quantity of water thus paid for as milk, at ten cents per quart, costs consumers about $12,000 a day, or over four and a quarter millions of dollars annually. In view of this fact, it is important to have some simple method of testing the amount of this adulteration, which, according to Professor Chandler, may be done by taking the specific gravity of the milk and determining the amount of water it contains by evaporating a weighed sample to dryness. Assuming the specific gravity of pure milk to be from about 1.029 to 1.032, whenever the gravity falls much below this the milk may be considered as adulterated with water. Dr. Davies, however, dissents from this statement, and asserts that the specific gravity can not be relied upon as a test either of freedom from adulteration or of natural richness. A sample known to him as perfectly pure and of excellent quality, rich in the solid constituents of milk, and especially butter, possessed a specific gravity of only 1.0246. He therefore concludes that the specific gravity test does not indicate whether the milk is naturally poor or has been rendered so by the addition of water. Cases have even been known of pure milk containing 90 per cent. of water. Dr. Davies therefore recommends as a test to show whether the milk has been purposely diluted with water, and if so to what extent, to take the specific gravity of the serum, or the liquid portion of the milk from which the caseine and fat have been removed by coagulation and straining. The gravity of this he finds to be remarkably constant, and ranging, in that obtained from pure milk, from 1.026 to 1.028. By carefully ascertaining the specific gravity of the serum of thin milk, diluted with various quantities of water, we may obtain a standard of comparison which will enable us to

say within a few per cent. what quantity of water has been added to any given sample of milk that may come to our notice.—1 *A*, *July* 29, 55; *August* 5, 61.

PHYSIOLOGICAL EFFECTS OF COFFEE.

An interesting communication was made at a meeting of the Academy of Sciences in Paris in regard to the value of coffee as an article of food. Attention was called to a statement of Mr. Gasparin, in 1850, that the miners of Charleroi preserved their health and great vigor of muscular force by the use of less than half of the nutriment indicated as necessary by theory and daily observation. Using food containing less nitrogen and carbon than the daily ration of the monks of La Trappe, whose countenances are pale, and who exercise scarcely one fifth as much as an ordinary workman, these Belgian miners were most industrious and energetic in their labors. The secret of the difference was stated by Mr. Gasparin to consist in the use every day by these miners of a pint of an infusion of about an ounce of coffee prepared in two quarts of water, which served the purpose of counteracting the injurious effect of an insufficient supply of food.

Reference was also made to an experiment in 1860, by Mr. Jousand, in which, by the use of a decoction of about an ounce and a half of powdered coffee, a young man was kept, with no other food whatever, in good health and strength for seven days, during which time he took more active muscular exercise than usual, without any special inconvenience.

The particular deduction from these experiments appears to be that coffee has an important action in preventing denutrition and emaciation. An illustration of this is seen, according to the author, in the effect upon the urea. In one experiment about half a grain of caffeine was consumed daily, and the amount of urea was diminished twenty-eight per cent., while an infusion of about two ounces of roast coffee diminished it by twenty per cent. This is asserted to be the result of very careful experiments of a physiologist upon himself, proving that caffeine and roast coffee diminish the oxidation of the system and temper the process of denutrition. The excessive frequency and intensity of the beating of the heart was also found to be reduced in several instances. It is probable, according to the author, that a sim-

ilar action is exerted by some other substances—the Paraguay tea, especially, which, it is well known, enables the natives of the Andes to subsist for a long time on an incredibly small amount of food.—6 *B*, *September* 12, 1870, 426.

RIGIDITY OF THE JAWS IN DROWNING PERSONS NOT A SIGN OF DEATH.

A recent writer assures us that the rigidity of the jaws in a person taken out of the water after long immersion, instead of being a sign of death, is really an indication that life is still present, as it disappears only when life is actually extinct. This, of course, is not to be confounded with the stiffening of the entire body after death, but refers entirely to the local symptom. We are therefore advised, under the circumstances indicated, not to lose hope, but to continue to make use of all the methods that present themselves as appropriate for the restoration of suspended animation, whether by the injection of air into the lungs, or by other means.—1 *B*, *September* 4, 163.

CONTRACTION IN RIGOR MORTIS.

In an abstract in *The Academy* of an article by Mr. E. Walker, lately published in Pflüger's *Archiv*, it is stated that in the rigor mortis of muscle produced by heat there is a diminution in the volume of the muscle. He shows, also, from another series of experiments, that the force of contraction in rigor mortis may equal or even exceed that excited in the living contraction of the muscle. In experiments in which muscle was frozen and thawed, sometimes quickly and sometimes slowly, he found that when slowly frozen and slowly thawed it preserved its contractility, but when these operations were quickly conducted this was soon lost. In no instance did the mere act of freezing cause the muscle to possess an acid reaction. Rigor mortis will take place even at a temperature of 32° Fahrenheit.—13 *A*, *June* 15, 316.

DISTINGUISHING REAL FROM APPARENT DEATH.

A new mode of distinguishing between real and apparent death has been recently submitted to the consideration of the Academy of Medicine in Paris. It consists in the insertion of a bright steel needle into the body; and it is said that

when life is present the needle soon becomes tarnished by oxidation, while on the other hand, if death has taken place, the needle will retain its brightness for half an hour or more. According to Dr. Laborde, the author of the communication, oxidation, with its attendant electrical phenomena, indicates that death is only apparent, and the entire absence of oxidation is a sign of real death.—6 *A*, *August* 20, 240.

SPONGY IRON AS A DEODORIZER.

By calcining a finely divided iron ore with charcoal, the species of iron known as spongy iron is obtained, which, according to Dr. Voelcker, is a deodorizer of greater potency than animal charcoal. By filtering sewage water through this material it becomes thoroughly purified, a much smaller quantity than is required of animal charcoal answering the purpose. Water treated in this way, and kept from exposure to the atmosphere, has remained perfectly fresh and sweet for many months without any indications of cryptogamic vegetation.—13 *A*, *February* 15, 141.

STYPTIC COTTON.

Dr. Ehrle prepares an excellent styptic cotton by boiling it first in a solution of soda, and then saturating it with a solution of chloride of iron. This is to be dried and kept for use, and is applied to a wound like ordinary lint, either directly or in coarse gauze fastened on by means of a compress. —1 *C*, XXIII., 363.

REMOVING WAX FROM THE EAR.

From careful experiments made by a physician of Lyons, it has been ascertained that the old remedy of warm water is the best solvent of accumulated wax in the ear, being superior to olive-oil, glycerine, etc.—14 *A*, *November*, 1870, 360.

SPONGE PAPER.

For the fabrication of an article called sponge paper, lately patented in France, evenly and finely divided sponge is added to ordinary pulp, and this is worked, as in the common papermaking apparatus, into sheets of different thicknesses. It is said to have all the peculiarities of sponge, absorbing water readily and remaining moist a long time. It has been used

as a dressing for wounds with considerable advantage, and is capable of several important technical applications.—6 *C*, *April* 28, 156.

LEAD-FOIL FOR DRESSING WOUNDS.

The use of lead-foil in the place of lint as an application for wounds and burns has been lately recommended in a communication to the Paris Academy of Sciences. The lead is made to adhere to the flesh by some glutinous substance, and it is said to have been highly beneficial in many cases where workmen were injured in factories. Lead is both cool and safe to the skin, and the sulphide of lead which is formed prevents putrefaction. One great recommendation is that the wound may be cooled without removing the lead by simply wetting the bandage with water, thus preventing the entrance of infected air and morbid germs.—15 *A*, *Aug.* 6, 180.

ELECTRO-ACUPUNCTURE OF THE ARCH OF THE AORTA.

Among the novelties of surgical science may be mentioned the use of electro-acupuncture for the relief of aneurism of the arch of the aorta, as practiced in Italy. Experiments in this direction have been quite successful, involving no danger, and giving the patient relief from great suffering.—5 *A*, *July*, 329.

GLYCONIN.

A mixture of five parts of glycerine and four parts of yolk of egg, under the name of glyconin, has been used to some advantage for the healing of wounds, the mixture forming a varnish over the skin impenetrable to air and moisture.—5 *C*, 1871, XXIX., 232.

PEGGING LOBSTER CLAWS.

Humanitarians in England have lately been considerably exercised on the subject of pegging the claws of lobsters in the fish-market, to prevent their injuring the incautious bystander; and it has been claimed that such a practice tends not only to give great pain to the animals, but also, by the laceration of the flesh, to induce a morbid condition of the system, and thus cause disease to persons eating them. It is asserted, in this connection, that many of the cases of poison-

ing from eating the flesh of these animals are traceable directly to this condition. To this statement a rejoinder is made, however, that when a crab or lobster finds one of its members injured, it has the power of shedding it at will, and that if much disturbance or distress were caused by the pegging in question, the remedy referred to would be applied. Formal complaint against the practice has been laid before the Lord Mayor of London, who has promised to have a careful investigation made, upon which he will issue his decision as to the legal practice for the future. The same custom exists largely in the United States, although we are not aware that the suggestion has been made that any unwholesome condition is thereby produced in the flesh.

In further reference to this subject, we are informed that in the city of Boston lobsters are never brought to market alive, but are always boiled on the shore almost immediately after being caught, and in that state offered for sale. The practice, however, is very different in New York, where they are brought in alive with the claws pegged. Careful inquiry has, it is said, revealed the fact that cases of disease from eating lobsters in Boston are extremely rare, and, indeed, are almost unheard of, while the contrary is the case in New York, many instances being known of sickness resulting from the use of lobsters as food.—2 *A*, *July* 23, 62.

REMOVAL OF FRECKLES.

Freckles, so persistently regular in their annual return, have annoyed the fair sex from time immemorial, and various means have been devised to eradicate them, although thus far with no decidedly satisfactory results. The innumerable remedies in use for the removal of these vexatious intruders are either simple and harmless washes, such as parsley or horse-radish water, solutions of borax, etc., or injurious nostrums, consisting principally of lead and mercury salts.

If the exact cause of freckles were known, a remedy for them might be found. A chemist in Moravia, observing the bleaching effect of mercurial preparations, inferred that the growth of a local parasitical fungus was the cause of the discoloration of the skin, which extended and ripened its spores in the warmer season. Knowing that sulpho-carbolate of zinc is a deadly enemy to all parasitic vegetation (itself not

being otherwise injurious), he applied this salt for the purpose of removing the freckles. The compound consists of two parts of sulpho-carbolate of zinc, twenty-five parts of distilled glycerine, twenty-five parts of rose-water, and five parts of scented alcohol, and is to be applied twice daily for from half an hour to an hour, then washed off with cold water. Protection against the sun by veiling and other means is recommended, and, in addition, for persons of pale complexion, some mild preparation of iron.—8 *C*, 1871, 90.

PINCUS ON HAIR DISEASE.

Dr. Pincus, of Germany, has just published the results of ten years' observation upon the rise and progress of the chronic diseases of the human hair. Among other conclusions, he informs us that, in most cases, all these diseases begin with a shortening of the typical length of the hair, this generally taking place in such a manner that in each single cluster of hairs (hair circle, as he calls it), whenever one hair is attacked by the disease the other hairs in the group follow at a greater or less interval. If the hair first attacked is shortened to the amount of one half its original length, a thinning of the hair immediately follows. In single cases, especially at the beginning of an attack of sickness shortly after puberty, both a shortening and thinning of the hair may occur simultaneously. This period of the course of the disease, in which the hair only fails in typical length, Dr. Pincus calls the first stage of chronic hair sickness. The first stage has hitherto remained completely unnoticed, and disease of the hair has only been appreciated when a considerable falling out or a reduction in the diameter of a portion of the hair has taken place.

In the treatment of chronic diseases of the hair, examination of the daily loss furnishes the most important means of determining whether the evil is increasing or diminishing. Without this guide it is difficult to appreciate the changes, excepting at intervals of three months, while the daily fall of hair furnishes an indication from week to week.

According to our author, the principal constants, from the practical examination of which satisfactory deductions can be made of the rise and progress of chronic disease of the hair, are, first, the daily falling out, especially the number of

hairs, and their length; second, the number of these that exhibit a distinct tip; third, the number in which a distinct root is wanting; fourth, the number of hairs with thinner and lighter roots; fifth, the number of hairs in which the diameter is less than the average. In the case of a lady of 35, of average health, the daily loss of hair was found to amount to about 73, or 220 in 3 days; of which 162, or 74 per cent., exhibited distinct tips. In 10 hairs there was no distinct root; and the ends of the root were unchanged in color and thickness in 27 hairs under six inches in length, and in 37 over 6 inches long.—1 *C*, XXVII., 420.

CURE OF BONE-FELON.

Professor Hüter, of Berlin, cures bone-felon, or whitlow, by first carefully probing the swelling of the finger, and making a small incision where the pain appears greatest. The pain of the operation, which may be lessened by the local application of ether, or by the inhalation of chloroform, can not be compared with the relief given to the patient after a few minutes. The after-treatment is equally simple. The small wound is to be covered with lint and carbolic acid, and bathed morning and evening in tepid water, and after a very few days is perfectly healed.—8 *C*, XVII., 132.

THE SEWING MACHINE ON THE HEALTH OF FEMALES.

Dr. Decaisne, in the *Union Médicale*, after a careful investigation of 661 female operatives upon the sewing machine, reaches the conclusion that these persons are not, as has been alleged, more subject than other working women to diseases peculiar to their sex, and that the cases which have been reported are evidently simple coincidences, and the results of a labor too severe for woman's strength.—3 *B*, *May* 26, 175.

CURE OF CHRONIC SOMNAMBULISM.

A foreign medical journal mentions two instances in which chronic somnambulism was cured by administering bromide of potassium, the dose given in one instance varying from 30 to 100 grains per day, and in the other case 15 grains were given both morning and evening. The attacks in each case gradually became less and less frequent, and in a short time entirely ceased.—3 *B*, *August* 8, 705.

DESTROYING THE TASTE OF COD-LIVER OIL.

An Italian physician, referring to the objectionable taste of cod-liver oil, and the many methods adopted to render it less obnoxious to sick persons, states that its peculiar smell and taste can be completely removed by digesting it with roasted coffee and ivory-black. For this purpose, one part of good roasted coffee and one and a half parts of ivory-black are to be mixed with twenty parts of cod-liver oil, and the whole placed for a quarter of an hour in a retort heated by steam to a temperature of 120° to 140° Fahr., after which the liquid is allowed to settle, and is then filtered. The oil, it is said, then tastes and smells precisely like coffee.

As iodine is said to lose not only its taste and odor, but also some of its chemical and physiological properties after being mixed with an infusion of coffee, it may be necessary to add a certain quantity of free iodine to the mixture thus prepared in order to restore that element to the oil.—21 *C*, *September*, 1870, 164.

NEW AFFECTION OF THE NERVOUS SYSTEM.

A peculiar and hitherto undescribed affection of the nervous system is mentioned by Dr. Fieber, of Vienna, as being characterized by an impossibility of executing moderately fast movements through the agency of the will, while extremely slow or very rapid movements can be executed without any difficulty.—20 *A*, *May* 27, 622.

SIGN OF HYSTERIA.

According to a French memoir, an infallible sign of hysteria consists in the insensibility of the epiglottis. This, as stated, may be readily determined by introducing the finger gently into the mouth, so as not to disturb the patient, and placing it upon the base of the tongue. In case of hysteria, the epiglottis may be displaced and scratched with the finger-nail without producing the least regurgitation.—6 *A*, *May* 13, 591.

CAUSE OF SUN-STROKE.

According to a late writer, sun-stroke is due to the action of light upon the brain, exerted through the eye, and not, as

generally believed, to an elevation of temperature; and it is asserted that, if the eye be properly shaded from the glare of the sun, any extra or unusual precaution in the way of protecting the head and back of the neck may be dispensed with. —12 *A*, *December* 29, 1870, 168.

PREVENTION OF SEA-SICKNESS.

It is said that the nausea and vomiting produced by swinging and sea-sickness can be resisted by applying to the epigastrium a layer of wadding dipped in collodion. This, we are informed, should extend over the xiphoid cartilage to the umbilicus, and be left until it falls off. If the adhesion be imperfect, the application should be renewed. According to the discoverer, the action of the peripheral nerves is interrupted by this application, just as the pain of calculi in the bile passages or ureters is sometimes mitigated by the application of castor-oil and collodion.—6 *A*, *October* 22, 527.

PROTECTION AGAINST SEA-SICKNESS.

Mr. Bessemer, the well-known inventor of the process for manufacturing steel bearing his name, has lately been engaged in completing his plan, already announced, of securing a comfortable passage at sea, in the most stormy weather, by constructing a cabin, the floor of which, under all circumstances, remains horizontal, no matter what motion may be given to the vessel. This cabin is circular in shape, and hung on gimbals at the centre, the point of suspension in the ship being so chosen that the cabin, as a whole, shall have as little vertical motion as possible. A vessel is now being constructed to test the plan, and, if the actual experiment result satisfactorily, it is believed that sea-sickness will be practically unknown during a voyage in a cabin of the new arrangement. —5 *A*, *October*, 1870, 431.

PHOSPHATE OF LIME IN MEDICINE.

A French author has recently written a work to impress upon physicians the importance of administering phosphate of lime in their practice. He professes to prove that this substance is, above all others, the natural supplement of the function of nutrition; that by its action the albuminous matter is made to take the form of cellular, and that it presides

over the organization of the tissues—that is to say, it is pre-eminently the agent of nutrition. The lacto-phosphate of lime is also recommended very strongly as an active agent in medicine; and in the distinctness of its action, and the positiveness of its effects, it claims to be ranked with bromide of potassium and chloral as one of the most valuable contributions of chemistry to the healing art made during the present century.—3 *B*, *June* 9, 248.

CURE OF ST. VITUS'S DANCE.

Among the more recent triumphs of medical science may be mentioned the method of treatment of chorea, or St. Vitus's dance, originally discovered in Europe, and first practiced in this country, we believe, by Dr. W. A. Hammond, of New York. This consists in the application, by means of a special apparatus, of ether-spray to the spine, the current being directed from the occiput to the sacrum, backward and forward for about six minutes each time, the treatment being renewed at proper intervals. Cases previously considered entirely hopeless have, it is said, been cured by a dozen applications of the kind referred to, although great care is necessary, as, if carried beyond a certain point, the treatment may prove injurious rather than beneficial.

TREATMENT OF CROUP BY INHALATION OF GLYCERINE.

A German physician, Dr. Stehverger, recommends the treatment of croup by the inhalation of pure glycerine through one or other of the well-known forms of atomizing apparatus. He was led to try this remedy for croup from observing its good effects in cases of hoarseness and loss of voice. After application the cough becomes more free and moist, and children are enabled to sleep almost immediately upon being relieved by the inhalation. It is, however, believed to be of importance to make use of the remedy early and frequently, as, if delayed, it may have no effect whatever. If the glycerine be pure, it may be used unmixed; if not, it should be diluted with a little water. The inhalations are repeated, according to the necessity of the case, at intervals of from half an hour to an hour and a half, and for about fifteen minutes at a time. The effect of the glycerine in this case is supposed to be due to the fact that the secretions of the mucous mem-

brane are thereby increased, and tumefaction reduced.—6 *A*, *February* 4, 143.

PERMANGANATE OF POTASH FOR COLD IN THE HEAD.

We find continued mention made in the foreign journals of the value of permanganate of potash as a remedy in cases of cold in the head attended with severe sneezing. For use in such cases, a solution is prepared of about one and two thirds grains of permanganate in two fluid ounces of water. Of this solution, twenty to sixty drops are to be poured into a tumblerful of water, and a table-spoonful is to be snuffed up the nostrils every two hours; and, if there be any soreness in the throat, the same liquid is to be used as a gargle. It will, perhaps, be better to apply this solution by means of the fountain syringe, or some other of the methods adopted for injecting salt and water, as a cure for catarrh.—5 *A*, *January*, 1871, 100.

COD-LIVER OIL BUTTER.

An ingenious pharmaceutist has lately adopted the method of making cod-liver oil into a butter, for the purpose of being administered to such patients as find an objection in the taste of the oil itself. This is done by combining the oil with a concrete or butyraceous fat, thus bringing it into a form in which it can be used as butter on bread, or made into pills. It is also suggested that, by mixing cod-liver oil with mustard, egg, and the other ingredients used in making salad dressing, the taste can be so disguised as to render it a palatable article for putting upon various articles of food.—8 *A*, *February* 1, 30.

HYPODERMIC INJECTIONS.

A committee appointed by the Royal Medical and Chirurgical Society of London to investigate the hypodermic method of administering medicine reports as follows:

1. That, as a general rule, only clear neutral solutions of drugs should be injected.

2. That, whether drugs be injected under the skin, or administered by the mouth or rectum, their chief physiological and therapeutical effects are the same in kind, though varying in degree; but,

3. That symptoms are observed to follow the subcutaneous injection of some drugs which are absent when they are administered by other methods; and, on the other hand, certain unpleasant symptoms which are apt to follow the introduction of the drugs by the mouth and rectum are not usually experienced when such drugs are injected under the skin.

4. That, as a general rule, to which, however, there are many exceptions, neutral solutions of drugs, introduced subcutaneously, are more rapidly absorbed and more intense in their effects than when introduced by the rectum or mouth.

5. That no difference has been observed in the effects of a drug subcutaneously injected, whether it be introduced near to or at a distance from the part affected.

6. That the advantages to be derived from this method of introducing drugs are—rapidity of action, intensity of effect, economy of material, certainty of action, facility of introduction in certain cases, and, with some drugs, avoidance of unpleasant symptoms.

It is farther stated that "we may safely take as a broad guide in practice the rule that the physiological activity of nearly every substance which can thus be used is three if not four times greater when it is given by the skin than when it is swallowed." The proper hypodermic dose of strychnine to begin with is said to be $\frac{1}{120}$ grain of the sulphate. The dose of atropine is also $\frac{1}{120}$ grain at first. The dose of morphine is $\frac{1}{10}$ grain to $\frac{1}{6}$ grain.

The circumstance that the action of medicines administered hypodermically is very rapid, and often instantaneous, renders the method invaluable in certain cases, as, for instance, in cases of poisoning by opium, where the application of atropine or belladonna is indicated.—14 *A*, *July* 9, 22.

AMMONIA INJECTION IN CHLOROFORM POISONING.

An application has lately been made of Dr. Halford's method of ammonia injection in another case of medical practice than as a remedy for the bite of poisonous serpents. In this instance a man had been suffering from delirium tremens, brought on by a long course of drinking, and under its influence procured and swallowed an ounce of chloroform. Insensibility immediately supervened, and his eyelids could be opened and the pupils touched without his showing the slight-

est indication of irritation. When the man was apparently dying, an injection of two drams of ammonia was made in the veins of the arm, with the most promising effect. Sensibility returned, and the patient was able to sit up and talk for five hours. The next day, however, he died, apparently from congestion of the brain; but it was thought that if his habits had not been so intemperate he probably would have entirely recovered from the effects of the chloroform.—20 *A*, *May* 27, 607.

VARYING EFFECT OF POISONS ON DIFFERENT ANIMALS.

It is a well-known fact that what is poisonous to one animal may be taken by another with entire impunity. In illustration of this proposition, we are informed that strychnine, so fatal to most animals, may be eaten by certain species of monkeys with perfect safety. In the case of an East India monkey known as the Lungoor (*Presbytis entellus*), one grain was first concealed in a piece of cucumber, which was eaten by the animal with no apparent effect. Three grains were afterward given, and with the same result. To test the strychnine used, three grains were administered to a dog, which proved almost immediately fatal. Another Indian monkey, known as the pouch-cheek monkey, has been found to be more susceptible than the Lungoor, but not so much so as the dog.

It is also stated that pigeons can take opium in large quantities with no injurious consequence; goats, tobacco; and rabbits, belladonna, stramonium, and hyoscyamus.—14 *A*, *June* 15, 570; *July* 2, 6, 1870.

PRESCRIBED DYES FOR CANDIES.

A police regulation has been recently established in some parts of Germany prescribing the substances that may be used for coloring candies and other edible articles. The variety is very great, and would seem to meet all necessary requirements. All the aniline colors, without exception, are prohibited.—6 *C*, *February* 16, 66.

CORROSION OF LEAD PIPES.

Most of us are aware of the danger incurred by the use of water which has passed through lead pipes, especially after

remaining in them for any considerable length of time, and various devices have been adopted, so that, while retaining the use of lead pipe, to prepare it in such a way as to render it harmless. A lining of block tin has been a favorite arrangement for this purpose; but a much simpler one has recently been suggested, which, it is said, is entirely satisfactory. The process consists essentially in converting the interior surface of the pipe into an insoluble sulphide of lead, the result of which is that water flowing through it will be as free from contamination as if in contact with glass. This is accomplished by passing a strong solution of the sulphide of potassium and sodium through the pipe at a temperature of about 212° Fahrenheit, and allowing it to act upon the metal for from 10 to 15 minutes. The Boston *Journal of Chemistry*, in commenting upon these statements, claims the credit of an earlier announcement of a similar treatment, which consists in dissolving one pound of sulphide of potassium in two gallons of water, and allowing it to remain in the pipe for twelve hours, or until the inside is thoroughly blackened.—8 *A*, *September* 1, 168.

POISONOUS ANIMAL EMANATIONS.

In a late communication of M. Chauveau to the Academy of Sciences of Paris upon the pretended virulent volatile emanations, and upon the condition in which the virus is thrown into the atmosphere by subjects laboring under contagious maladies, he endeavors to show that the contagious peculiarity in virulent humors does not depend upon the substances dissolved, but upon the solid particles which these humors hold in suspension. From this he concludes that the forms of virus improperly called volatile are incapable of spreading into the atmosphere, and that the elements endowed with virulence can exist in the atmosphere only in the condition of emanations from diseased subjects; that is to say, that they assume the form of solid particles held in suspension.—3 *B*, XIII., *July* 27, 728.

POISONING BY CHARCOAL FUMES.

From observations made by Drs. Eulenberg and Vohl, of Cologne, it would appear that the poisonous carbonic oxide gas is generally to be found in common charcoal, and that it

may, under certain circumstances, become dangerous to human life. When newly-burned charcoal is stored in a cellar and overflowed by an inundation, carbonic oxide may be displaced and pass into the rooms above. It is said, also, that sleeping upon charcoal has proved fatal. Wherever an open charcoal fire is kept burning for a long time, as in laboratories, or for heating sad or soldering irons, etc., fresh charcoal having, of course, to be added from time to time, the attendants frequently suffer from headache and vertigo. Should the fact be as just suggested, that fresh, cold charcoal is impregnated or saturated with carbonic oxide, it is evident that the gas will be expelled by the heat before the coal reaches the temperature of ignition, and will thus infect the air. The same is the case in high furnaces when coke is used. On the other hand, it is known that the use of live coals, viz., charcoal heated to redness in a furnace constructed for the purpose, rarely proves injurious. The Dutch coal-pan (*stoofjas*) for keeping one warm, or for heating food, is sufficient evidence of this fact.—15 *C*, 1871, 58.

BONE-BLACK AS AN ANTIDOTE.

Charcoal, and especially animal charcoal, is extensively used in technical establishments for decolorizing sirups and other organic substances. A German chemist directs attention to its property of absorbing inorganic bodies also, and suggests that bone-black might occasionally serve as a valuable antidote in cases of poisoning. Lead, copper, mercury, small quantities of arsenic, alkaloids, etc., are removed from solutions by the action of animal charcoal, while phosphorus is fixed by it. This latter property is especially recommended for application in all the establishments where vapors of phosphorus abound. It is thought that a respirator filled with animal charcoal would do better service as an air filter than the use of spirits of turpentine, recommended by Letheby, which in many cases has an injurious effect in itself.—8 *C*, XVII., 131.

THE MBOUNDOU POISON.

The mboundou poison, used for ordeals on the Gaboon, and described by Du Chaillu and other travelers in Africa, has recently been the subject of analysis and experiment by two

French chemists. The plant was found in a moist soil ninety miles inland, near the River Como. The root is from twenty to twenty-seven inches long, and from one third of an inch to one inch in diameter. The bark is reddish, and the color below the epidermis bright red. The wood is grayish-white and hard. The experiments were made chiefly with the bark, but some with the wood and root. The infusions, even when very weak, are extremely bitter, and with iodide of potassium yield abundant precipitates. Alcoholic are more powerful than the aqueous extracts. Four grains of extract dissolved in water, given to a dog, produced violent tetanic convulsions, but in two hours the animal recovered. Six grains killed a dog in twenty minutes, the animal dying of asphyxia and tetanic convulsions. The action of the poison is very rapid, but fatal consequences may be prevented by artificial respiration.—17 *A*, *September*, 131.

REMEDY FOR CARBOLIC ACID POISONING.

Sweet-oil or castor-oil, swallowed in large quantity, is recommended as the most efficient antidote to carbolic acid, when taken in a poisonous dose.—14 *A*, *November*, 1870, 366.

POISONING OF CATTLE BY ACORNS.

It is stated that cattle died by scores in Gloucestershire, England, during the past fall, from having eaten acorns that had fallen off during a gale. When once taken ill, death followed more or less quickly in each case, no remedy being sufficient to allay the resulting inflammation. The poison appeared to induce a blackening and rotting away of the mucous membrane.—*Newspaper.*

CALOMEL A POISON FOR MICE.

A preparation of one part calomel, five parts of wheat flour, one part of sugar, and one tenth of a part of ultramarine, all mixed together in fine powder and placed in a dish, is said to be a most efficient poison for mice.—15 *C*, XII., 191.

TURPENTINE AN ANTIDOTE TO PHOSPHORUS.

It is said that oil of turpentine is a very powerful antidote to phosphorus poisoning, the experiment having been tried successfully upon dogs.—9 *C*, 1870, 78.

POISONOUS COLORS.

The result of some recent experiments by Mr. Guyot, upon the poisonous qualities of certain products of the phenyl group, are summed up in a late communication as follows: That azuline is or is not poisonous, according to its method of preparation; when it contains an excess of aniline it is poisonous; and when prepared with poisonous coralline it may contain phenol, and, in consequence, act upon the epidermis. Prepared with rosalic acid, even itself poisonous, azuline may be harmless when it is properly washed. Lydine purified, or free from prussiates and from aniline, does not act upon the skin. This purification of lydine is best accomplished by means of a succession of solutions in alcohol, and a partial precipitation by the aid of soda. Azuline and lydine may be employed in dyeing and in the printing of cloths.—6 *B*, 1870, 877.

POISONOUS VEGETABLE OILS.

Mr. Skey, in the course of a chemical investigation of the Tutu plant of New Zealand (a species of *Coriaria*), thinks he has ascertained that the poisonous principle does not reside in a vegetable alkaloid, as is generally the case in noxious plants, but in the oil; and he suggests that this may be the case with other poisonous plants, from which no poisonous alkaloid has hitherto been derived. He cites the case of castor-oil, which possesses peculiar properties, and does not contain any of the acids of the common oils or fats, but has acids entirely peculiar to itself.—1 *A*, 1869, *December* 30, 313.

CHLORAL HYDRATE AND COD-LIVER OIL.

An Italian pharmaceutical journal contains the announcement that by the addition of hydrate of chloral to cod-liver oil this substance will be rendered much less nauseous, while at the same time preventing the night-sweats of the patient, inducing sleep, and creating an appetite. The formula given consists in adding ten grains of the crystals of pure chloral hydrate to one hundred and forty grains of the cod-liver oil, and digesting them in a sand-bath at a gentle heat. The dose is to be six table-spoonfuls daily.—20 *A*, *June* 24, 713.

HYDRAMYLE.

The new anæsthetic, hydramyle, to which we have already referred, continues to grow in promise of value, having now been administered quite frequently by Dr. Richardson with much success. It seems especially adapted for short operations, such as the extraction of teeth, and is so rapid in its action that in one instance the patient was rendered insensible, a molar tooth extracted, and recovery completed in the space of fifty seconds. For the extraction of a tooth Dr. Richardson allows the patient to inhale for twenty to twenty-five seconds, and then, although still conscious, the vapor is withdrawn, and afterward a deep but brief period of unconsciousness comes on, during which the operation is performed. The delay in the production of anæsthesia is due to the insolubility of the hydramyle, time being required for the blood to take up the narcotic and carry it to the nervous centres after the lungs have been charged with the vapor.—20 *A*, *July* 1, 14.

CHLORIDE OF ÆTHYLIDE, A NEW ANÆSTHETIC.

We are informed that Dr. Liebreich, to whom we owe chloral, has discovered a new anæsthetic, to which he has given the name of Chloride of Æthylide. This substance is said to be more rapid and equable in its effects than chloroform, and has the farther merit that it does not interfere with the free and natural breathing of the patient. As the effect of the application is stated to be very transient, the dose must be repeated in a lengthened operation.—10 *C*, *March* 1, 59.

CHLOROMETHYL AS AN ANÆSTHETIC.

According to a report by Dr. Rossi, experiments instituted at the University of Padua upon the use of bichloride of methylene as an anæsthetic showed that, out of 108 operations, in only eight was there any vomiting, and that in every respect this chloromethyl should have the preference over chloroform for surgical purposes, having for the last three years replaced both chloroform and ether in that city. The London Medical Times and Gazette gives the experience of Mr. Spencer Wells in two hundred and fifty operations with this substance, showing a close coincidence in the general re-

sults with those of the Italian operators.—20 *A*, *August* 19, 234.

MODE OF ADMINISTERING CHLORAL.

According to M. Limousin, of Paris, some of the difficulties which attend the application and use of hydrate of chloral may be avoided by taking advantage of its property of becoming liquid at a temperature of about 112°, placing it at this heat in capsules or pill-covers, where it readily solidifies in cooling. In this way the medicine may be kept in a state of purity, and for any length of time, divided into doses of definite extent, according to the necessities of the case. It is a serious question, however, whether, introduced into the stomach in its concentrated condition, it is not liable to produce dangerous action upon the mucous membrane. The inventor of the process is decided as to its harmless character, but some of his colleagues have protested against employing it in practice before careful experiments as to the point in question.—6 *B*, *July* 25, 288.

CHLORAL IN SEA-SICKNESS.

The British Medical Journal refers to the use of the hydrate of chloral as a means of producing sleep for a definite number of hours with certainty, and thus enabling one to escape the discomforts of a short sea passage, and perhaps even to cause the more prolonged manifestations of sea-sickness to be mitigated. In several cases where the experiment was tried, this substance was said to have been of much value, even in lengthened voyages, giving a good night's rest, overcoming a violent sickness when it had set in, and stopping the tendency to its recurrence.—6 *C*, *December* 10, 789.

METACHLORAL.

Dr. Richardson, of London, has lately been experimenting upon metachloral, a substance possessing mild narcotic properties, isomeric with chloral, and produced when chloral hydrate is brought into contact with sulphuric acid. Chloral is also changed spontaneously into metachloral when kept for a long time in a stoppered bottle, or when a quantity of water insufficient to produce the hydrate is added to it. Heat converts metachloral into the liquid chloral, which becomes the

hydrate on the addition of a sufficient quantity of water. Dr. Richardson also calls attention to the fact that chloral, from its affinity to water, is a caustic, and that its use may, perhaps, sometimes be advisable in this connection, in view of its after soothing effects.—20 *A*, *March* 18, 311.

APOMORPHIA.

A substance known as apomorphia, discovered by Dr. Matthiessen and Mr. Wright a year or two ago, promises, according to Dr. Gee, to be of some importance in a medical point of view. It is obtained by subjecting chloride of morphia for several hours to the action of strong hydrochloric acid at a high temperature. Chloride of apomorphia is the result, from which the base can be separated; but, as it is very unstable, the salt has been generally used. The principal chemical differences of apomorphia from morphia consist in having one molecule less of water. It is a white crystalline powder, soluble in thirty parts of cold, and much less of warm water, and its special function is its remarkable emetic powers, which act rapidly and certainly. According to Dr. Gee, it always produces favorable results when employed, and by a single dose. As the salt is free from any alcoholic irritant preparation, it can be used hypodermically. A very small dose is one fifth of a grain by the mouth, or one tenth by hypodermic injection (which answers the purpose much more rapidly and freely), while the action, unlike that of other emetics, is not accompanied or followed by any ill effects. In general, the vomiting seems to put an end to itself, there being no subsequent nausea. Attention has lately been called to this drug on account of its important qualities as an emetic, since no other substance, as such, can be administered by subcutaneous injection, and all others are bulky, uncertain, and generally produce distressing nausea and depression.—14 *A*, *January* 7, 545.

BUHSA AS A NARCOTIC.

A narcotic used by the inhabitants of Central Asia, known as buhsa, is prepared by the Kirghises by rubbing millet to a pulp with water, and, after diluting this with still more water, and occasionally with mare's milk, the mixture is poured into a large stone jar, tightly corked, and buried in the soil.

It is left for ten days, and, after being taken up, the fluid is transferred to glass bottles, which, after being corked, are left standing a few days, when they are ready for sale. A large amount of carbonic acid is formed in these bottles, which escapes when they are uncorked. The taste is tart and spirituous, and is offensive before one is accustomed to it, owing to the presence of fusil oils. This drink is very popular, but rather intoxicating, and its use has been forbidden by the Russian military authorities.—1 *A*, *October* 28, 215.

CHLORALUM.

The hydrated chloride of aluminium has recently been recommended very warmly by Professor Gamgee, under the name of chloralum, as an antiseptic and disinfectant, being, as stated by him, as potent as chloride of zinc or carbolic acid, and at the same time non-poisonous, and free from any unpleasant smell whatever. At present it is somewhat expensive in its preparation, although, if it be really all that is claimed, some method will doubtless be devised for manufacturing it at a cheap rate. It may be prepared by mixing solutions of sulphate of alumina and chloride of calcium, both of them cheap commercial products. In this operation sulphate of lime is precipitated, while the hydrochloride remains dissolved. This may be evaporated at a gentle heat, crystals forming on cooling.—18 *A*, *September* 2, 559.

CHLORALUM.

The new antiseptic commended by Professor Gamgee, and known as chloralum, bids fair to be of much value in its applications in domestic economy and in medicine. The advantages claimed are the possession of antiseptic qualities equal to those of any other substance, while, used in moderation, it is entirely free from smell, from unpleasant fumes, has no disagreeable taste, and is without any irritant or poisoning qualities. According to Professor Gamgee, by its use as an antiseptic, raw-hide, meat, and other animal substances, immersed in a solution of 1.030 to 1.040 specific gravity, will be preserved perfectly for an indefinite period of time, and, what is still more to the purpose, will not be attacked by insects after being removed from the solution. Fish, slightly tainted, when immersed, recovers its freshness of appearance, and be-

comes firm and palatable. In some instances fresh fish, such as salmon, when caught, were dipped in the solution, and, after a passage of several days, without ice, to London, in the summer season, were found to be entirely eatable. This substance is suggested as an aid in drying cod on the coast of Newfoundland and elsewhere, as thereby an immense mass of fish that are now rejected could be readily preserved. The offal of cod and mackerel fisheries, which is now thrown overboard, could be preserved by this substance as long as might be required, and then carried on shore to be converted into one or other of the various forms of fish guano.

For disinfecting purposes, a solution varying from 1.006 to 1.010 is sufficiently strong to answer the desired object, stronger solutions being usually unnecessary and imparting a disagreeable smell. The solid matter of sewage is said to be precipitated more rapidly by this substance than by the use of the persalt of iron, and the odor disappears entirely. The use of chloralum in any epidemic, the cattle plague, or other contagious disease, including the epizoötics, is indicated by the author of the communication. Finally, it is recommended for the treatment of wounds, erysipelas, gangrene, and various contagious and inflammatory diseases. It may also be used for the purpose of immersing the linen of patients before removing it from the sick-chamber. For the purification of water-closets it is said to have no equal in any of the preparations hitherto recommended, and has also the advantage over nearly all the rest of being free from any offensive odor. —3 *A*, *November* 25, 1870, 385.

VALUE OF VARIOUS ANTISEPTICS.

Dr. Crace Calvert, in a recent paper, gives the result of investigations into the antiseptic power of various substances. One series of experiments consisted in placing in uncorked bottles solutions of albumen and of flour-paste, and then adding various portions (from two to five per cent.) of the different antiseptics in question. The result of the experiments proved that the only real antiseptics known at the present time are carbolic and cresylic acids, all other mixtures acquiring an unpleasant odor in from five to sixteen days.

The second series of observations consisted in placing a known quantity of the antiseptic in the bottom of a wide-

mouthed pint bottle, and suspending over it, by a thread, a piece of sound meat. In this case, again, the meat became putrid in from four to twenty-five days, excepting in the case of the acids just mentioned, over which the flesh remained untainted, but dried up quite hard. Chloralum, which has been much praised lately as an antiseptic, was found to be below the average as a preservative.—1 *A, December* 9, 281.

CARBOLIC ACID IN TANNING.

The use of carbolic acid in the process of tanning, for the purpose of preventing putrefaction, especially during the summer season, has been announced, and we learn from the detailed specification of the patentee, Mr. Baudet, that from five to ten grains of carbolic acid to one quart of the tanning liquid will secure perfectly the desired object. Should the hides have already commenced to putrefy, any farther action can be arrested by agitating them in water containing from twenty to thirty grains of carbolic acid to the quart of water, and retaining them there for some time. Dried leather, under the same patent, is to be moistened with water containing carbolic acid before stretching, while in the manufacture of chamois leather the fat used for lubricating it is to be mixed with from .004 to .007 parts of carbolic acid. Oil leather—that is, leather which has been dyed black on the flesh side, the hair side of which has not been scraped off, is also tanned by immersing the skins in a solution containing one per cent. of carbolic acid, or exposing them in boxes to the vapors of the acid. It is claimed also that furs may be protected from moths by a similar treatment. The application of carbolic aoid not only prevents putrefaction, but also the formation of mould—a matter of much importance. When used in the manufacture of gold-bronzed leather, it also prevents the appearance of the dark red or dull black coloration of the bronze by destroying the ferments which tend to produce this effect.—17 *A, February* 1, 27.

CARBOLIC ACID PAPER.

Carbolic acid paper, which is now much used for packing fresh meats for the purpose of preserving them against spoiling, is made by melting five parts of stearine at a gentle heat, and then stirring in thoroughly two parts of carbolic

acid, after which five parts of melted paraffine are to be added. The whole is to be well stirred together until it cools, after which it is again melted and applied with a brush to the paper, in quires, in the same way as in preparing the waxed paper so much used in Europe for wrapping various articles.—5 *C*, IV., 1871, 32.

CARBOLIC ACID FOR WOUNDS.

M. De Clot gives it as his experience, during the present war in Europe, that wounded soldiers may, without injury, remain unattended to forty-eight hours, if necessary, provided that the wounds are covered with lint or linen, and kept moistened with a solution containing three per cent. of carbolic acid. He also says soldiers may be protected against typhus, dysentery, and other similar diseases by giving them, morning and evening, a wine-glass of carbolic water, containing not more than half per cent. of the acid.—5 *C*, XL., 1870, 314.

CARBOLIC ACID AS A PRESERVATIVE.

Reference has been made in some of the scientific journals to experiments upon carbolic acid as a means of preserving objects of natural history, and the anticipation has been indulged by many that, by means of this powerful agent, we shall be able to replace all the ordinary methods of taxidermy. This, however, is a very great mistake, since it can be used to a small extent only in the preparation of entire bodies of animals that are to be preserved dry, because the process of desiccation will inevitably proceed until the original form of the animal is entirely lost. For many purposes, however, carbolic acid has proved of much value as a preservative, and its uses are increasing. Thus, diluted with about fifty times its bulk of water, it forms a capital substitute for alcohol in preserving fish and other objects, and, in fact, the larger fish, such as rays, sharks, etc., can be kept much better by its aid than even by means of alcohol. Added in small quantity to very weak spirit, it very materially increases its strength.

Although it can not be used as a substitute for the usual methods in setting up birds and mammals, it can be employed to very great advantage in keeping them fresh until they can

be properly skinned. An experiment of this kind was once made by Dr. Totten, of New York, who prepared a solution of one dram of carbolic acid, one and a half ounces each of glycerine and a dilute alcohol, and injected it into the mouth, the rectum, and under the skin of a large cormorant. The bird was kept on board ship until it reached New York, a period of about two months after its capture, and was then sent to a taxidermist, who found it to be in a perfect condition, and he was able to mount it as satisfactorily as if it had been but just killed.

CARBOLIC ACID IN SNAKE POISONING.

Nature informs us that, according to recent French investigations, the application of carbolic acid after the bite of a viper is a remedy both for local and general poisoning. The acid is to be used in the proportion of two parts to one of alcohol, and must be applied at once, since if given internally or applied to the wound at a late period it has no effect. It is believed to act, not by neutralizing the poison, but by contraction of the small vessels, thus preventing absorption. —12 *A*, *July* 20.

COLOMBIAN CURE OF THE BITE OF A POISONOUS SERPENT.

A native of Colombia has lately announced that the bite of a poisonous serpent can be cured by simply dropping melted sealing-wax upon the fang-marks, the result being a slight cautery, and a complete exclusion of the air in consequence of the adhesion of the wax.—12 *A*, *August* 10, 287.

CARBOLIC ACID NOT A PERFECT DISINFECTANT.

A writer in the *English Mechanic* advises its readers not to put implicit faith in carbolic acid as a disinfectant, as he believes its merits to have been greatly overrated. As a deodorizer he considers it far inferior to ordinary chloride of lime, the effect lasting only a short time. He finds that the vapor of chlorine is very much superior for the purpose, as it always destroys the vitality of infectious and diseased germs, which carbolic acid does not. To completely disinfect an apartment that has been occupied by a patient suffering under small-pox, typhus fever, or other disease, it is only necessary to vacate the apartment after stopping up the openings,

and placing in different parts of the room several plates containing a quantity of common salt on which a little vitriol has been poured. The vapor of chlorine will be instantly evolved, and will annihilate all infection with which it comes in contact. It may be used even in rooms containing sick persons, if the quantity evolved be so slight as not to inconvenience the lungs of the patients.—18 *A*, *August* 25, 571.

LIEBREICH'S PEPSIN.

A recent German writer, in referring to some new chemical preparations, speaks of the formula for preparing pepsin as published by Dr. Liebreich, and remarks that until lately this substance, once so frequently prescribed, has gone almost entirely out of use in consequence of the readiness with which it undergoes decomposition. He adds, however, that the experience of a year with the article as prepared by the new process has shown that this is perfectly unchangeable, and when compared with pepsin made freshly by the other formula is far superior to it in its efficiency. One somewhat unexpected application of the new pepsin is based upon its tendency to destroy fungous growths, on which account it has lately been used in diphtheria by painting the inner surface of the mouth with it. Some most extraordinary cures have already resulted from this application, and it is commended earnestly by the writer in question to farther experiment. It is also said to exercise a beneficial effect, when mixed with foul drinking-water, in destroying those fungous germs which are so productive of mischief in causing diarrhœa and cholera.

EXTRACTION OF PEPSIN BY GLYCERINE.

Among the many applications of glycerine, not the least important is that which has recently been made of it in the extraction of pepsin and other ferments found in animal and vegetable bodies. If the mucous membrane of a pig's stomach be well washed, and, after the removal of the water, be reduced to fine shreds and bruised, and the whole be then covered with pure glycerine, this will be found, after standing twenty-four hours, to have extracted the pepsin in an appreciable quantity so as to readily digest fibrine. The operation may be repeated several times successively with a similar result.

On treating these glycerine extracts, after filtering, with a large excess of alcohol, a precipitate is obtained, which, separated by filtration, and being redissolved in acidulated water, has strong peptic qualities, with very slight proteid reaction. Mr. Foster, in calling attention to this method in *Nature*, dwells upon the importance of glycerine in this and similar applications in working out the problems of the so-called ferments, as these glycerine extracts seem to remain unchanged for a long period, thus allowing a stock of ferment to be continually kept on hand. He also remarks that the tissues, by repeated application of glycerine, may be exhausted of their ferment, and yet be changed but little, if at all, in other respects.—12 *A*, *December* 29, 168.

ACTION OF BROMIDE OF POTASSIUM.

Since the first introduction of bromide of potassium into the *materia medica*, there has been a great diversity of opinion in regard to its value as a remedy, some praising it extravagantly, and others denying it any specific virtue. Most writers, however, are satisfied that, judiciously administered, it is a substance of very great merit, although its mode of operation is even yet not entirely understood. According to Dr. Amory, its effects are produced by the direct action on the blood-vessels, or the vaso-motor system which controls the action of these vessels, and he thinks that this action will account for and explain all the physiological and therapeutical influences of the drug. He states that the bromide is easily absorbed by the mucous membrane and by the skin, provided the water in which it is dissolved is below the temperature of 75°; that its elimination is conducted by the skin and the kidneys, and that in therapeutical doses it is not eliminated by the intestines or the lungs; that it passes out of the skin without decomposition; that the larger the dose, the more intense and enduring the influence in the vaso-motor system; and that its action in the general nervous system is consequently dependent upon that of the vaso-motor nerves, upon which it acts as a sedative. The highest value of the remedy as a medicine is said to lie in its remedial powers over epilepsy, being of signal service in the vast majority of cases, while absolutely curing very many, and rarely failing to diminish the number and violence of the attacks where it does

not cure. One advantage of the bromide of potassium is said to be that it can be given without any danger whatever. Certain inconveniences sometimes present themselves, such as the production of acne, or other eruptions on the face or elsewhere, although, on the other hand, such diseases have sometimes been cured by it. In full doses it is said sometimes to cause redness of the palate, epigastric heat, salivation, drowsiness, confusion of mind, depression, failure of memory in a remarkable degree, weakness of the arms and legs; but all these evils disappear entirely on the discontinuance of the remedy, no permanent ill effects having been observed to follow its employment.—14 *A*, *January* 7, 567.

POISONOUS QUALITIES OF BROMIDE OF POTASSIUM.

Bromide of potassium has of late years been a great favorite with the medical profession on account of the many virtues it is said to possess in cases of nervous diseases and cerebral affection. We are, however, in a recent medical thesis, solemnly warned of various ills that have attended its use, such as a decrease of strength, muscular weakness, trembling of the hands, emaciation, loss of appetite, and many other evils. These, however, are said, on the other hand, to depend probably on the excessive use of this substance, or on its application in cases where the general symptoms would properly forbid its employment.—*Mayer*, *Toxicologie des Broms.*

HYDROBROMATE OF CODEIA, ETC.

Few substances of the vegetable kingdom furnish so extensive a field for investigation as opium, and we seem even yet to be far from having determined all its simple constituents, to say nothing of the combinations which these are capable of forming with one class of bodies or another. In the course of an elaborate inquiry by Dr. Wright upon the action of hydrochloric and hydrobromic acids upon codeia and morphine, two of these opium bodies, it was ascertained that the salts thus formed produced a very peculiar physiological action upon animals, whether administered by subcutaneous injection or by the mouth, this application to adult cats developing in a very few minutes a condition of great excitement, almost amounting to delirium, and accompanied by a copious

flow of saliva and a great dilatation of the pupils. This appeared to be due, in part, to increased sensitiveness to noise, and partly to an impulse to rush around. When the same tests were made with kittens, though there were the same general effects produced, the stage of excitement, which in adults passed off gradually in a few hours, was followed by a condition closely resembling that of alcoholic intoxication, especially in the want of co-ordination of muscular movements. Rabbits, on the contrary, appeared to be affected but little, or not at all. Vomiting was not observed in any of the cases experimented upon.—1 *A*, *June* 30, 304.

FAYRER ON SNAKE-BITES.

Our readers will pardon us for having so much to say in reference to supposed remedies for poison by snake-bites, but the importance of the subject must be a sufficient excuse, as we are at present adrift in regard to any reliable remedies, those that have been accepted with implicit faith for so many years having proved to be, in the opinion of competent investigators, almost entirely worthless. The method of injecting ammonia into the veins, as devised by Dr. Halford, of Australia, and brought forward with so much positiveness, seems, after all, of little or no practical value, at least in other places than Australia. This is shown most conclusively by the detail of a series of experiments, the results of which have been lately published by Dr. Fayrer, of Calcutta, as having been made with great care.

The conclusions to which Dr. Fayrer arrives are that, in the present state of our knowledge on the subject, we can do but little in these cases except to neutralize or counteract the action of the poison, while as to antidotes, he has but slight hope of the discovery of any thing that shall prove to be such in the ordinary sense. His experiments were made, of course, chiefly upon lower animals, with a view to test the effects of the poison as administered by himself, supplemented by observations of cases where he was called to visit patients professionally. The animals experimented upon were the ox, horse, goat, dog, cat, pig, mungoose, fowls, fish, harmless snakes, poisonous snakes, lizards, frogs, toads, etc. He found the intensity of action of the poison of different serpents to vary quite considerably, that of the cobra, perhaps,

being considered as representing the most venomous, while the *Calophides* and the *Crotalidæ* are generally treated by the natives as being much less so than the others.

The general symptoms of poisoning he considers to be of much the same character. In some cases the convulsions, however, are more marked than in others, death being preceded in some by a more lethargic appearance; but in every case the symptoms all point to exhaustion and paralysis of the nerve centres, every function failing rapidly, and vitality soon becoming extinct. A complete loss of consciousness is generally preceded by local paralysis, great depression, faintness, exhaustion, nausea, vomiting, hemorrhage, relaxation, and involuntary evacuations, not unfrequently of a sanguineous or muco-sanguineous character. Little is shown by a post-mortem examination beyond the marks of the fangs and of the wounds immediately around them, although in certain cases infiltration, and perhaps decomposition of the tissues, appear. The lungs are not congested, nor is the heart overloaded. The viscera appear natural, and death does not seem to be dependent upon the disturbance of any one particular function. A remarkable difference is seen in the effect upon the blood by the bite of different species. Thus, in the case of the lower animals, the blood coagulates firmly on being removed from the body when death follows from poisoning by the colubrine snakes, while in cases of death by the poison of the viper it remains permanently fluid. No explanation is given of this peculiarity. From experiments, Dr. Fayrer ascertained that the poison acts with more vigor on warm-blooded animals, birds being especially sensitive—a fowl sometimes being known to die in a few seconds. The power of resistance generally appears to be in proportion to the size of the animal, although cats seem to resist the influence of poison almost as long as dogs of three or four times their weight. Cold-blooded animals he found to succumb to the poison more slowly, though fish, non-venomous serpents, and mollusca all die. He, however, agrees with the observation of Dr. Mitchell and others, that poisonous serpents are not affected by their own bite; that is, that a cobra may bite itself or another cobra with no evil result, but that the less poisonous serpents are somewhat affected by the more poisonous kinds, although slowly. Strange as it may appear,

the bodies of animals that are poisoned by snakes may be eaten by man and animals with impunity. Of this the experimenter had frequent proof. He found, however, that the blood of an animal that died from snake-poison is itself poisonous, and that if injected into another animal it destroys life. Although venomous snakes are not affected, or but slightly, by snake-poison, they readily succumb to strychnine or carbolic acid, the latter substance appearing to destroy them very rapidly, and to be an object of special aversion.

The usual remedies in the way of antidotes Dr. Fayrer considers of very little account, as being either powerless or quite inert. A ligature, excision, or cautery, if applied in time, appears to be the only rational remedy that can be of any avail in a really poisonous case. Stimulants are not unfrequently judiciously recommended, but as antidotes, in the ordinary sense of the term, they have no special value.—20 *A*, *April* 1, 374.

CUNDURANGO—A REPUTED SPECIFIC FOR CANCER.

The State Department at Washington received, in the spring of 1871, through the minister from Ecuador to the United States, specimens of a plant known as cundurango, found in the province of Loya, in Ecuador, to which marvelous qualities in curing cancer and other similar diseases are ascribed. The physicians of Quito have been experimenting upon this substance, and report most wonderful cures, and a limited quantity of the plant has been sent to the United States in order to secure proper experiments upon it on the part of the American faculty. No intimation is given of the botanical character of the plant, the fruit of which, however, is said to be highly poisonous.

Its virtues were first discovered, according to a communication accompanying the specimens, entirely by accident. An Indian had been suffering fearfully for a long time from internal cancer, and his wife undertook to relieve him by shortening his life by poison. For this purpose she selected the cundurango; but, not being able to obtain it at the time of its fruit-bearing, she made a decoction of the bark. To her astonishment, the first application appeared to benefit the patient rather than otherwise, and by a continuance of this remedy he was completely cured in a short time.

INFLUENCE OF ALCHOLISM ON THE SIGHT.

In a paper read before the Académie de Médecine, some interesting remarks were presented by Mr. Galezowski upon the influence of alcoholism on the sight. Cases of this form of amblyopia were frequently brought on during the siege of Paris, as the author believed, by drinking alcoholic liquids in the morning on an empty stomach. The characteristic symptoms are a somewhat sudden enfeebling of the sight, which, however, then remains for several weeks without any sensible change; the acuteness of vision is sensibly diminished, and that of distant objects, especially, is much lessened, the face of a person not being recognizable at some paces' distance, in consequence of a sort of white haze appearing to envelop every object. The haze is less apparent toward evening, and the sight consequently then improves. A curious perversion of the faculty of appreciating colors occurs in this disease. Thus carmine, red, and green are often confounded with each other, while violet is taken for red, and yellow for red. The vision is often double and triple, and colors of objects become very much mixed. This disease, according to the author, is due to an affection of the longitudinal muscular fibres of the arteries, which act by dilating them, and to a spasmodic contraction of the circular fibres of these same vessels. The result of this is to prevent the arrival of the blood in sufficient quantity for the arteries. An application of the extract of Calabar bean was found to be quite efficient in removing the difficulty.

The paper sums up the general conclusions of the author in the following language, as quoted by the London *Medical Times:* 1. This disease appears as a consequence of prolonged indulgence in alcoholic drinks, and especially when these are taken fasting, or before dinner; 2. Bad food and a wretched condition of existence predispose to its development; 3. Complete abstinence from alcoholic drinks during several weeks or months is an indispensable condition for recovery; 4. The bromide of potassium is a very efficacious remedy; and the éserine, or Calabarine collyrium, is one of the best means of combating the visual disturbance; 5. This amblyopia is tractable when combated at an early period; but later it becomes a serious affection, which is very difficult of cure.—20 *A, May* 6, 517.

TREATMENT OF SMALL-POX SUBJECTS.

During the prevalence of small-pox in Paris last spring the police authorities required the bodies of those dying from it to be sponged in a liquid composed of one hundred and eighty grains of carbolic acid in a quart of distilled water. Formerly chloride of calcium was used; but this had the great inconvenience of rendering it almost impossible for any one to remain in the room with a corpse. The carbolic acid solution in question is said to have all the advantages of chloride of calcium, with none of its inconveniences.—2 *B, June* 18, 669.

VALUE OF REVACCINATION IN SMALL-POX.

Most of our readers are aware of the extent to which the small-pox has ravaged France, and especially Paris, and of the continued discussion of remedies and indications of the disease. In response to a request from the Minister of the Interior to the Imperial Academy of Medicine the following statement of established facts was returned: First, vaccination is a preservative against small-pox; second, in every instance, after a certain time, revaccination is expedient to secure complete exemption from contagion; third, revaccination is an absolute security from danger; fourth, revaccination is useful at all ages; fifth, it can be employed without inconvenience during the existence of the epidemic, and it is perfectly well established that in certain localities—in the bosom of families, in boarding-schools, and other agglomerations of individuals—it has succeeded in arresting upon the spot an epidemic just begun; sixth, the actual epidemic of small-pox, which prevails in Paris and other points of French territory, has supplied a most convincing proof of the protective power of revaccination; finally, it was stated that in various army corps, and especially in the Garde de Paris, and in many public and private establishments, particularly in some of the municipal schools, the small-pox was entirely checked after revaccination; and also that the latest statistics, especially those collected in the civil hospitals of Paris, prove in the most positive manner that persons recently revaccinated have been attacked only in a very small proportion, and very lightly, and so as not to figure in the statistics

of mortality. It is therefore concluded that it is in the highest degree important, both in the interest of the individual and of the public, to continue to extend in every possible way the practice of revaccination.—3 *B*, *July* 14, 469.

VACCINATION IN AFRICANS.

The London *Lancet* publishes a communication in regard to vaccination in Africans which will be of interest if substantiated by farther experiments, namely, that the vesicles take a longer time to develop than in the white man. This experiment was tried by Dr. Mortimer in several instances, all of which proved the correctness of the proposition as asserted. Whether the same condition of things applies to the negro in the New World is not stated by the writer.—6 *A*, *November* 12, 622.

SMALL-POX IN ENGLAND.

A wave of epidemic small-pox seems to be at present moving over the greater part of the world. This has already been noticed in various places in the United States, and in an equally marked degree in Europe. Paris has been afflicted with it for a long time, so as to have invoked the greatest care to ameliorate or eradicate the disease. Great Britain is now experiencing the infliction, which in London is more destructive at the present time than it has been at any period during the present century. The scientific and medical journals of that city are filled with suggestions for action, and insist that no disease is more directly under human control than the small-pox, and that the points to be aimed at are, in the first place, vaccination of every person in the city, and revaccinating wherever necessary; and, second, precautions in the way of purification, isolation, and disinfection. That vaccination does act to a very great degree in the prevention of the disease is considered by most of the journals unquestionable, the statistics showing that the proportion of deaths is very much less in districts where vaccination has been attended to than elsewhere. It is also shown, in the rare instances where vaccinated persons have taken the disease, that it is much less fatal than it would otherwise have been, and that in the present epidemic not more than six per cent. die of small-pox of those who have been vaccinated, while about

thirty-six per cent. die of those who have not been vaccinated. This same proportion was observed in the London Small-pox Hospital from 1836 to 1851, from which it is inferred that there has been no change in the malignity of the disease.

As to the question whether vaccination ever loses its protective power, it is stated, as the result of many observations, that when the operation has been properly performed the immunity from liability is almost entire, but that it is sometimes difficult to determine the perfection of the preventive, and that revaccination, while doing no harm, may do much good. It is urged also that, in addition to vaccination, every small-pox patient should at once be removed to a hospital, or subjected to complete isolation, and that disinfection of clothing and all objects contaminated should be carried on by heating the articles, by free use of carbolic acid and other disinfectants, and by destroying the rags, beds of straw or shavings, etc., with which the patients may have come in contact.—12 *A, March* 2, 341.

IMPROVED METHOD OF VACCINATION.

In view of the great spread of the small-pox at the present day in America and Europe, and the importance of successful vaccination, the suggestion of an English physician, Mr. Ellis, may be of some importance. This gentleman remarks that ordinary vaccination is performed by scraping off the epidermis and thrusting the vaccine virus into a puncture made by the lancet. A greatly improved method, however, consists in first raising a small blister by a drop of cantharides applied to the skin. This is to be pricked, and the drop of fluid let out, and then a fine vaccine point put into this place, and withdrawn after a moment of delay; the epidermis falls back and quite excludes the air, shutting out any germs that may be floating in the atmosphere. This method has been practiced by Mr. Ellis for twenty years, and out of hundreds of cases of vaccination which he has performed he has never had an instance of blood poisoning or abscess, while by the ordinary method the occurrence of secondary abscess is by no means uncommon, and that of pyæmia is often observed. The comparative safety of this method is believed to be due, first, to the exclusion of the air; and, second, to the lesser size

of the aperture for the introduction of mischief than when the punctures are made by the lancet.—12 *A*, *June* 15, 124.

THEORY OF CHOLERA.

Mr. Alpheus Cholmeton, of the Department of the Gard, in France, republishes his theory in regard to cholera. This, he thinks, is occasioned by the development of animalcules arising from dead bodies that have not been properly buried. These animalcules, in floating through the atmosphere, are inhaled by mankind, which results, under certain circumstances, in producing disease. We are especially advised, therefore, in cholera times, particularly when in attendance on cholera patients, to wear a veil of a very thick texture, and, perhaps, to breathe through cotton, so that the parasites can not pass. He maintains that these organisms can be seen in the atmosphere as a visible column, especially at about the time of the rising and setting of the sun. One conclusion to which he arrives is that it is very important that dead bodies be buried to a sufficient depth, and that it would be still better to resume the practice of burning the dead, as was done to so great an extent by the ancients.—*Letter of Alpheus Cholmeton.*

CHOLERA.

Our readers are well aware of the varying opinions entertained by men of science in regard to the cause and propagation of cholera as a disease, and are familiar with the persistency with which it has been asserted by some that the disease arises from the development of a particular kind of fungus. An elaborate report has just been published by Dr. Lewis upon the microscopic objects found in cholera evacuations in India, and, after a careful inquiry, under very favorable circumstances, he comes to the conclusion that the cryptogamic theory must be abandoned. He finds that the so-called cholera cells of Dr. Swayne and others are of various kinds, some of them certainly not fungoid in their nature, while others are ova of acari and of intestinal worms. The cysts upon which Dr. Hallier dwells with so much weight Dr. Lewis could not find in fresh cholera discharges, although he had repeatedly developed them. Other unusual bodies proved to be either fragments of tissues or ova, none of them peculiar

to cholera. Cultivation does, however, succeed in developing from the cyst certain cryptogamic bodies, although only three per cent. of the experiments were successful, and similar cysts were found to be developed in discharges other than choleraic. The bodies resembling spores, so common in cholera discharges, Dr. Lewis finds to be either globules of a fatty nature, altered blood-cells, corpuscles imbedded in a tenacious substance, or a globular condition of certain infusoria.

The subject of the so-called *micrococcus*, which Dr. Hallier supposed to be the germ of cholera, Dr. Lewis examined critically, without being able to find any evidence to prove the existence of such bodies or having such relations.

The general results reached by Dr. Lewis, as summed up by him, are, first, that no cysts exist in choleraic discharges which are not found under other conditions; second, that cysts or "sporangia" of fungi are very rarely found under any circumstances in alvine discharges; third, that no special fungus has been developed in cholera discharges, the fungus described by Hallier being certainly not confined to such; fourth, that there are no animalcular developments, either as to nature or proportionate amount, peculiar to cholera, and that the same organisms may be developed in nitrogenous material even outside the body; last, that the supposed débris of intestinal epithelium is not of this origin, but appears to result from effused blood plasma.—12 *A*, *March* 16, 392.

PHYSIOLOGICAL ACTION OF QUININE.

An eminent native physician in India, in discussing the physiological action of quinine in malaria, remarks that the symptoms in the early stages of disease show that the force of the poison is expended upon the ganglionic system of nerves, and, as the circulatory apparatus is under the direct control of this system, we can easily understand why influences exerted over the latter may modify its governing power. In a word, the effect of the malaria is concentrated upon the ganglionic centres of the system, altering their functions in such a way as to disturb the circulation and secretions of the body, to paralyze the blood-vessels, and lead to inflammation, hypertrophy, or death; in short, acting as a sedative to the sympathetic nervous centres. Quinine now acts as a nervine tonic to the organic system, counteracting the morbid

influence, promoting digestion and secretion, and giving tone to the heart, and improving the pulse in strength and volume. In intermittent fever, given before the expected paroxysm, it cuts short the attack by remedying that condition which produces the flush in the blood-vessels, and by giving them tone. It has no peculiar virtue in neutralizing the poison of malaria, but it is an invaluable remedy in all fevers. When, however, the altered circulation leads to inflammation of an organ, or to some morbid change, it is suggested that its use is at least doubtful.—20 *A*, *March* 4, 245.

A NEW REMEDY FOR INTERMITTENT FEVER.

German physicians, as appears from medical journals, have found a tincture of the leaves of the *Eucalyptus globulus*, or Australian gum-tree, to be a remedy for intermittent fever. Dr. Lorimer gave it to fifty-three patients, of whom forty-three were completely cured. In five others there was a relapse, owing to a failure in the supply of the tincture. In eleven of the cases quinine had been used without effect, and nine of these were cured by the *Eucalyptus*. This tree, of considerable size, grows in Australia. Its wood is very hard, and is used in ship-building.

TREATMENT OF SCARLET FEVER.

Mr. Lennox, in a communication upon the very prevalent epidemic of scarlet fever through England and Wales, calls attention to certain common-sense views in regard to its treatment which commend themselves to all thoughtful persons. He remarks that, although we may not always be able to control the appearance of the disease, yet, when it has been developed, its further progress is, or should be, entirely under our control, since it is a contagious disease, and, as such, capable of being antagonized. In this case, as in many other diseases, the poison is evidently propagated in the form of germs, whatever be their character, which, thrown into the air, and falling upon or entering the body, give rise to renewed cases. In scarlet fever these germs appear to retain their vitality for an unusual length of time, one case being mentioned where a piece of flannel, worn around the neck of a scarlet-fever patient, was picked up and used two years after, and developed a fresh case of the disease. In a certain

instance of an outbreak of scarlet fever over a wide neighborhood, it was ascertained that in every instance this took place in families that had been supplied with milk by the same milkman. On inquiry, it was found that persons connected with the farm from which milk was supplied had been infected with scarlet fever. The precautions to be taken, according to Mr. Lennox, after the disease has made its appearance, are, in the first place, to isolate the patient, at whatever trouble or expense, preventing the approach of any one excepting the nurse and physician. With this, disinfectants must be used with the utmost freedom, whether they be carbolic acid, permanganates of soda and potash, chloride of zinc, chloride of aluminium, chlorinated lime or soda, sulphate of iron, etc. These should be employed in and around the patient. All his discharges and excretions should be immediately disinfected, and all bed-clothing and linen worn by the patient treated with the same care. Nurses in attendance, and physicians touching the patient in any way, should also wash their hands in a disinfecting solution before leaving the room. Woolen clothing that can not be washed should be exposed to a heat of at least 212°, this temperature having the property of destroying the poisonous germs. Even after the patient has apparently recovered, the precautions should be maintained until the peeling off of the cuticle, or the scales, has been entirely accomplished, as in many cases the disease has been traced to the particles of this character.—12 *A*, *November* 17, 1870, 41.

LIEURNUR METHOD OF REMOVING NIGHT-SOIL.

The difficulty of solving the problem of the economical and speedy removal of night-soil is a subject that is continually pressing upon the attention of our cities with increasing weight, and numerous propositions looking toward this end have been discussed or adopted. Among others, that of Mr. Lieurnur, of Haarlem, has been received quite favorably, and is being brought into practical application in various portions of Europe. This consists in the establishment of a series of iron pipes, which bring the soil into iron reservoirs, and which are so connected with an air-pump as to be capable of exhaustion. When this is done the connecting pipes are opened, and the pressure of the air forces more or less of

the excrement with which they are laden into the reservoir. From this it is taken up by means of a pump into a specially arranged air-tight wagon, and carried off to be manufactured into a fertilizer.—14 *C*, CCI., 86.

UTILIZATION OF SEWAGE.

A report, published by a committee of the British Association, relative to the treatment and utilization of sewage, takes the ground that it is only by filtering this material through the earth itself that the dissolved and suspended substances which are the food of vegetable and the poison of animal life can be kept out of our rivers and applied to the production of growths. After this straining, the liquid matter that escapes may, according to the report, be allowed to enter into the rivers without producing any of the deleterious effects that accompany the introduction of the original sewage matter. Light, porous, and gravelly soils, and even blown sand, thus treated with sewage, furnish crops of great richness, and meadows watered with this substance yield an astonishing growth of grass.—15 *A*, 1871, *January* 7, 22.

INFLUENCE OF THE SEWING-MACHINE ON THE HEALTH OF FEMALES.

Dr. Decaisne, in the *Union Médicale*, after a careful examination of 661 female operatives upon the sewing-machine, reached the conclusion that these persons are not, as has been alleged, more subject than other working-women to diseases peculiar to their sex, and that the cases which have been reported are evidently simple coincidences, and the results of a labor too severe for women's strength.—3 *B*, *May* 26, 1870, 175.

CURE OF COLD IN THE HEAD.

Dr. Franc, of Munich, informs us that coryza, or cold in the head, with severe sneezing, can be cured perfectly, in from two to four days, by preparing a solution of permanganate of potassa in the proportion of about one and a half grains to two fluid ounces of water. Of this solution some twenty to sixty drops are to be poured into a tumblerful of water, and every two hours a table-spoonful is to be snuffed up the nostrils; and if there be any soreness the same may be used as

a gargle. The remedy may be applied much more efficiently by means of the fountain syringe now so much in use, replacing advantageously the solution of salt in water so generally resorted to in connection with the apparatus.—1 *A*, *November* 25, 1870, 262.

EUCALYPTUS A FEBRIFUGE.

The cultivation of the *Eucalyptus globulus* is making rapid pogress in the south of France, Spain, Algiers, and Corsica, especially on account of its alleged virtues as a remedy for fever. It furnishes a peculiar extractive matter, or alkaloid, called eucalyptine, said by some to be as excellent a remedy against fever as quinine. In Spain its efficacy in cases of intermittent and marsh fevers has gained for it the name of "fever-tree." It is a powerful tonic and diffusible stimulant, performs remarkable cures in cases of chronic catarrh and dyspepsia, is an excellent antiseptic application to wounds, and tans the skins of dead animals, giving the fragrance of Russia leather. The tree prefers a marshy soil, in which it grows to a great height very rapidly. It dries the earth under it by the evaporation from its leaves, and shelters it from the sun, thus preventing the generation of marsh miasm.—20 *A*, *November* 11, 1871, 596.

ELIMINATION OF NITROGEN IN CASES OF FEVER.

In a treatise by Dr. Unruh upon the elimination of nitrogen in cases of fever, he sums up the result of his researches by stating that the total amount of such elimination is greater in fevers by perhaps fifty per cent. than in the normal condition of the body, but that it is not proportional to the elevation of its temperature. In the crisis of the fever oxidation of nitrogenous substances is increased; but in certain cases the elevation of the temperature is the primary cause, and brings about a secondary increase of the elimination. The warmth produced by the increased oxidation of the nitrogenous substance is not sufficient to explain the frequently excessive temperature in fevers. The fever, in and of itself, produces no increase of the uric acid. This, however, may occur in consequence of the insufficiency of respiration. Sulphate of quinine is an antipyretic remedy, but is not an absolutely certain one.—*Medical Thesis.*

PHYSIOLOGICAL ACTION OF ACONITE.

Messrs. Gréhaut and Duquesnel have been lately prosecuting some inquiries into the physiological action of *aconitine.* Among other experiments, they injected one twentieth of a milligram under the skin of the back of a frog. Thirty minutes afterward the sciatic nerve had completely lost its motoricity, though the muscles of the thigh contracted when stimulated by an induced current, and the heart beat regularly. In another experiment one leg of the frog was tied so as to arrest circulation, and the frog then poisoned with aconitine. All the motor nerves which received the poisoned blood lost their physiological properties, while those of the preserved limb remained excitable.

From these results it appears that small doses of aconitine are analogous in physiological results to curarine in destroying the motor power of the nerves. A dose of one milligram of aconitine, however, injected into a frog (twenty times as much as that used in the first experiment) completely arrested the action of the ventricles of the heart, the auricles alone contracting feebly; the excitability of the motor nerves continued for a long time in this case, and the animal continually moved, spontaneously or convulsively. By microscopic examination of another frog similarly treated, it was found that in one minute and a half the arterial circulation was much slackened, and in three minutes had completely ceased; the nerves did not lose their motoricity, because, through the cessation of circulation, they did not come in contact with the poison.

In mammalia the effects of the poison show themselves more rapidly, and are more difficult to analyze; a milligram of aconitine injected into a rabbit in which artificial respiration was kept up was found, after half an hour, to prevent the sciatic nerve from producing contraction of the muscles, although these had preserved their contractility.—21 *A*, *October*, 1871, 948.

CURE OF FLATULENCY.

A writer in the *English Mechanic*, in treating of the not unimportant subject of flatulency, says that of this there are two kinds. In health the stomach and intestines always con-

tain a moderate quantity of gas that is nearly pure nitrogen. This appears to be secreted by the mucous membrane of the stomach and intestines, and, in excessive amount, is one of the most troublesome kinds of flatulence. The other kind arises from fermentation or putrefactive change of the food, and contains carbonic acid, and sometimes sulphureted hydrogen as well as nitrogen. Both these forms of flatulence are best treated by using pure vegetable charcoal finely powdered—taken in the first case with each meal, and in the second as soon as the symptoms appear. The dose may be a tea-spoonful, and its use should be continued for some time. This will usually correct constipation as well as looseness of the bowels, besides relieving the disease itself.—18 *A*, *September* 15, 1871, 651.

IODIZED COTTON IN SURGERY.

M. C. Méhu, in discussing the ordinary method of applying iodine in cases of glandular swelling, goître, etc., finds that the use of solutions is, in many cases, attended with inconvenience, and proposes to apply carded cotton, which, when impregnated with iodine in a special manner, is equally efficacious as a remedy, and unattended by any serious disadvantages. The iodized cotton is prepared in the following manner: A quantity of perfectly dry cotton, of good quality, is introduced into a stoppered flask of one-liter capacity, together with about one tenth of its weight of finely powdered iodine, in such a manner as to distribute the iodine pretty evenly throughout the mass of cotton. The flask is then partially closed, and gradually heated in a sand-bath to expand the air. After a short time it is firmly stoppered, and the heat raised until the flask is filled with the vapor of iodine; this latter slowly combines with the cotton, causing it to assume a deep yellowish-brown color. As soon as the whole of the iodine is fixed on the textile fibre, and the violet vapor is no longer visible, the operation is terminated; the whole process, if well conducted, being effected in about two hours. Twenty grains of cotton wool will be found sufficient for one liter; it is also unadvisable to exceed the proportion of ten per cent. of iodine, since, for general purposes, a cotton of half this strength is sufficiently active.

Although cotton can be made to absorb in this manner so

large a proportion of iodine, it nevertheless preserves, in a great measure, its original tenacity. Its color is brown, and not black, which latter is sure to be the case if the heat employed be too high, or if its action be too greatly prolonged. —21 *A*, *October*, 1871, 967.

CARBOLIC ACID NOT A PERFECT DISINFECTANT.

A writer in the *English Mechanic* advises its readers not to put implicit faith in carbolic acid as a disinfectant, as he believes its merits to have been greatly overrated. As a deodorizer he considers it far inferior to ordinary chloride of lime, the effect lasting only a short time. He finds that the vapor of chlorine is very much superior for the purpose, as it always destroys the vitality of infectious and diseased germs, which carbolic acid does not. To completely disinfect an apartment that has been occupied by a patient suffering under small-pox, typhus fever, or other disease, it is only necessary to vacate the apartment after stopping up the openings, and placing in different parts of the room several plates containing a quantity of common salt on which a little vitriol has been poured. The vapor of chlorine will be instantly evolved, and will annihilate all infection with which it comes in contact. It may be used even in rooms containing sick persons, if the quantity evolved be so slight as not to inconvenience the lungs of the patients.—18 *A*, *August* 25, 1871, 571.

NOXIOUS GASES OF MANUFACTURING ESTABLISHMENTS.

The chemical effect of the gases of various manufacturing establishments upon the health of plants and animals in their vicinity has frequently been a subject of investigation, and it has been shown that serious injuries may result therefrom. In the course of a recent inquiry in a village near Berlin, it was found that vegetation was seriously affected over a circle covering an area of from two thousand two hundred to six thousand five hundred feet, the establishment occupying the focus of an ellipse of noxious action, elongated in the direction of the prevailing wind. In the case of rye plants, the stalks were green a few inches from the roots, while above this the color was gray, and the flowers did not fructify. Potatoes appeared as if they had been attacked by the potato disease, and plants of all kinds showed evident signs of more or less injury.—14 *C*, C., 336.

PURIFICATION OF WATER BY SPONGY IRON.

A process for purifying water by means of spongy iron has lately been patented in England by Dr. G. Bischaf, of Bonn. The energetic action of iron upon organic substances in solution has been long known, but its application in the form of cast-iron, iron-wire, etc., were without practical results, the effect being too slow. A filter of spongy iron, on the contrary, acts rapidly and thoroughly, the most offensive water immediately losing its color and smell, and keeping sweet and in a serviceable condition for a long time. The substance in question can now be had in any quantity, and at a moderate price.—6 *C*, xx., 198.

GUATEMALA AS A RESORT FOR CONSUMPTIVE PERSONS.

A recent communication by Dr. James Wynne, of Guatemala City, to the Royal Medical and Chirurgical Society of London, calls attention to the advantages of the Pacific coast of tropical America, and especially of Guatemala, as a residence for consumptive patients. This city is situated five thousand feet above the sea, in latitude 14° 37′ 32″ north, having a mean temperature of 66° F. The climate is that of perpetual spring; the air is tonic and invigorating, yet not too stimulating. Consumption is very rarely met with, and phthisical patients coming from a distance, if able to lead an open-air life, make remarkable progress. Of twelve cases recorded, four died, five recovered, while three still remained under observation. Of the fatal cases, the disease had reached a hopeless stage in all but one before being seen for the first time. It is suggested that the value of the Central American plateaus in phthisis should be tested by sending out twenty patients in an early stage of the disease for a few years, or, better, for a permanent residence.—*Pr. Royal Med. and Chir. Soc., London*, 1871, VI., 368.

CARNINE AN ELEMENT OF MEAT EXTRACT.

It has been generally supposed that the nutritive properties of meat extract, and especially its power as an assistant in the assimilation of other nutritive bodies, is due to the presence of creatine and creatinine. Weidel, however, has shown that they depend upon a new base, *carnine*, which con-

stitutes about one per cent. of Liebig's Extract. Doses of one half to two decigrams of carnine, and its hydrochloride, appear to have a slight effect on the nerves, a slackening of pulsations being the most marked symptom.—21 *A*, *August*, 1871, 716.

DIMINISHED FAVOR OF MEAT EXTRACTS.

The favor with which the various forms of meat extracts were received some years ago is now diminishing, and it is even stoutly maintained that they are inferior to the beef tea prepared in the old-fashioned way. This result has been caused by the fact that the meat extract has been found to be composed almost exclusively of salts, and to be entirely destitute of albumen, and even of the gelatine which is contained in beef tea, causing it to coagulate when cold. Although the meat extracts are possessed of some valuable qualities, they are now generally believed to be far from having the virtues once ascribed to them.—20 *A*, *Dec.* 9, 1871, 721.

PROPER RATION OF FOOD.

In a public lecture, delivered at the Medical School of Paris, in regard to the quantity of food required to keep a man in a vigorous and healthy state, Dr. Sée remarked that the daily allowance for an adult might be enumerated as follows: 1540 grains of meat, 300 grains of salt fish, 11,550 grains of bread, 770 grains of lard, and 770 grains of dried and compressed vegetables; a total of about 15,000 grains of solid food, containing 1350 grains of albuminous matter. Incidentally he observed that crust of bread contains just twice as much nutrimental value as crumb, which has 44 per cent. of water. The highly nutritive value of wine was specially alluded to, and illustrated by the fact that, in some districts of France and Spain, men live on bread and wine only, for many weeks together, in a healthy and vigorous state.

BUTTERMILK FOR INFANTS.

According to several recent authorities on the Continent, buttermilk furnishes a very valuable nutriment to suckling infants, especially if a little rice meal or wheat flour be beaten up in it. It is also stated that children fed with this substance are much less liable to the ordinary diseases of infan-

cy, and that they recover from them much more readily than those fed upon fresh milk.—8 *C, June* 9, 1870, 181.

CUNDURANGO.

Many of our readers have become quite familiar during the past few months with the name of cundurango, a tree found in Ecuador, the young stems and roots of which are claimed to be a specific cure for cancer and other diseases. A quantity of this was sent by the government of that country to the State Department in Washington, to be experimented upon by some physicians of that city, and the result of the inquiry having been satisfactory, a special expedition was sent out to obtain an increased supply. Much controversy has arisen, however, as to the real virtue of the plant, many physicians denouncing the whole movement as savoring of quackery and humbug. The precise botanical relationships and character of the plant have been until recently unknown; but we now learn from the *Andes*, of Guayaquil, of July 29, in a communication from Dr. Buyon, that it belongs to the order *Eupatoriaceæ*, and species *Mikania guaco* of Endlicher, and that its name of cundurango, in the Quichua language, means vine of the condor. It is the same plant that is called guaco in Colombia. According to the tradition of the country, when the condor is bitten by a poisonous serpent it swallows the leaves of the guaco plant, and experiences no harm. In Colombia there are said to be three varieties of the guaco—green, purple, and white—the purple variety being intensely bitter, the white less so and more aromatic, while the green has more astringency.

Dr. Bliss, of Washington, is understood to be the great champion of the cundurango, and claims to have accomplished several notable cures upon prominent personages, and considers it to be as reliable a specific in cancer, and scrofula, and other blood diseases as cinchona and its alkaloids have proved to be in zymotic diseases. It is quite certain that for many years this plant has been brought forward in tropical America as an invaluable cure for a variety of diseases. As the *Mikania guaco* is found abundantly in South America, it ean readily be obtained without going into the interior of Ecuador, should it answer all the expectations of its partisans.—*Panama Star and Herald.*

CUNDURANGO AGAIN.

The subject of cundurango continues to excite the interest of scientific and medical men in both hemispheres. Our South American and European periodicals alike make frequent reference to the subject, taking every variety of ground in regard to the value of the drug. A member of the Pharmaceutical Society of London concludes, as the result of experiments, that the plant has very little practical value; these determinations, however, being based, according to the votaries of the article, upon experiments with inferior or spurious specimens of it.

Dr. Jaramillo, of Guayaquil, recently announced that his experiments have not been satisfactory in the cases of cancer, but have been eminently successful in curing syphilis, as well as intestinal, urethral, and uterine ulcers caused by the syphilitic diathesis, and thinks that, whatever be the stage of the disease, very positive benefit must result from its application. Some of his experiments were tried with a decoction of the wood without the bark, but the combination of the two he considers desirable.

Reduced to a powder, he says an ounce will kill a good-sized dog, while for ordinary medical treatment a decoction obtained from not less than an ounce nor more than a pound is advisable. The milk of the plant he has applied to ulcerated surfaces, and found that this hastened cicatrization. He refers to statements of Dr. Buyon, of which we recently gave an extract, and thinks that his experiments must have been performed with some other plant, and that the guaco, or cundurango of Ecuador, is not the same as that of Colombia, the one being the *Equatoria garciana* (a name, however, not known to botanical science), the other *Mikania guaco.* According to Dr. Jaramillo, a man aged fifty, who had suffered fourteen months with rheumatism, and who had become contorted in an extraordinary degree, was cured in two months by the external and internal use of this substance. These statements we commit to our readers without, of course, pretending to decide what amount of importance is to be attached to them.—*Panama Star and Herald, November* 2, 1871.

N. MISCELLANEOUS.

COMMUNICATIONS TO THE SOCIETY OF PHYSICS AND NATURAL HISTORY OF GENEVA.

Among first-class institutions devoted to scientific research in Europe, the Society of Physics and Natural History of Geneva has always borne an honorable part, its publications containing material in all branches of science of the utmost value. The last volume of the memoirs embraces the usual summary by the president of the papers presented to the society, in this instance for the year extending from June, 1869, to June, 1870. Among the more important of these are the following: A memoir by Professor De la Harpe upon the theory of numbers, in which he shows that cubes have a common measure among themselves. Professor Schaix gives a conjectural map of the region of Central Africa indicated by Livingstone as containing the source of the Nile. Professor Plantamour reports upon the results which had been accomplished by himself and Professor Hirsch in connection with the geodetic survey of Switzerland. Professor Gautier discusses the observations made by the Moravian missionaries upon the coast of Labrador, where the thermometer ranges from a very low temperature in winter to quite a high point in summer. M. Risler, in the course of experiments upon evaporation from the soil, ascertained that during the years 1867 and 1868 about seventy per cent. of the amount of rain which fell was passed off annually by evaporation. M. Forel, in a somewhat similar investigation, discovered that the Rhone furnished a larger amount of water than could be supplied by the rain-fall of the country, and concluded that the excess was derived from the direct condensation of the moisture of the atmosphere upon the glaciers and the snow-fields of the mountains. M. Forel also suggests an ingenious method of obtaining the temperature at the bottom of lakes, namely, by drawing up a quantity of mud and testing its temperature immediately, the degree ascertained being sufficiently near that of the water itself at the bottom to answer all purposes.

Numerous communications were made in reference to the

existence of man in prehistoric times, one of these, by M. De Saussure, describing the contents of a cavern occupied during the reindeer period, while another paper, by Professor Desor, had reference to objects of the bronze age from the Lake of Bienne, where they were found under four feet of mud. Dr. Waller publishes a paper upon the absorption by the skin of different substances dissolved in chloroform, such absorption being generally much more rapid than when alcohol or acid solutions of the same substance were employed. Thus, in experimenting upon an albino rat, he found that if one of the feet of the animal were plunged into a chloroformic solution of atropia, a marked dilatation of the pupils of the eye was observed in two or three minutes, while this substance dissolved in alcohol produced the same effect only after a much longer period.

Professor Plateau presents a paper upon the flight of coleoptera, and Dr. Marcet gives the result of investigations upon himself while ascending various high mountains, especially Mont Blanc, showing a variation of temperature of the body at different altitudes during repose and on the march. He found that, during the ascent, the temperature fell considerably, but that it soon became normal on coming to rest. The unpleasant sensations experienced at great elevations are also accompanied by a remarkable depression of the temperature of the body. M. Humbert announces a curious instance of mistaken instinct in animals, in the fact that a specimen of *sphinx*, or hawk-moth, was observed to be attracted by the representations of flowers painted upon the tapestry of an apartment, and that it applied its trunk successively to many of them without discovering the illusion, showing that some insects, at least, are guided by sight rather than by smell.

Professor A. de Candolle suggests the inquiry as to whether it may not be possible to discover some remains of animals and of plants belonging to the period of the elevation of the Alps, and remaining buried in the eternal snow since that time. He thinks that such fossils may yet be found in the cavities or fissures at the summits of high mountains, and proposes to prosecute inquiries in this direction.

We present, in this brief summary, a mention of some only of the more popular and interesting communications to the Genevan Society, there being still a number, of more or less

scientific value, that we have not referred to. We give on another page a separate account of the important researches of Professor Claparède relative to the bryozoa and annelides. —*Mém. Soc. de Physique, etc., de Genève*, XX., II., 1870, 543.

ON NOMENCLATURE OF UNITS OF FORCE AND ENERGY.

Professor Everett calls the attention of the British Association to the necessity of giving names to *absolute* units of force and of energy—that is, units not varying with locality, like the gravitation units vulgarly employed (pound, foot-pound, etc.), but defined by reference to specified units of mass, length, and time, according to the condition that unit force, acting on unit mass, produces unit acceleration. He proposed that the units of force and of energy (or of work), thus related to the gramme-metre and second, be called respectively the *dyne* and the *pone*, and the names *kilodyne*, *megadyne*, *kilopone*, *megapone*, be employed to denote a thousand and a million of these fundamental units. After the reading of the paper the subject was considered by the mathematical and physical section of the Association, and a committee was appointed, conjointly with one from the section of mechanical science, for the purpose of framing a nomenclature of units of force and energy.—15 *A*, *August* 19, 209.

CAUSE OF THE INCREASED EXPLOSIVENESS OF CERTAIN BODIES.

According to *Les Mondes*, the explosive properties of inflammable matter are not dependent on the elevation of the temperature of the atmosphere, but upon its hygrometric state, as explosions take place in winter as well as in summer. Gunpowder during a drought will acquire spontaneous explosive qualities, even without any elevation of temperature, and is more ready to act from the smallest spark. The least quantity of oxalic acid, however, is sufficient to prevent spontaneous action of explosive materials, and without, at the same time, modifying the propelling properties of the powders. Thus, if a pulverulent mixture of sulphur and chlorate of potash, or any other combustible substance ready to furnish detonating compounds, be combined with one third part of oxalic acid, and then heated even to the degree of fusion, there will be no explosion. The action of the acid is believed

to have a catalytic influence that precedes the abandonment of the basic particle of water of this substance, any excess of acid being without effect upon the general result. It is suggested that this, if true, will have an important bearing upon the manufacture of explosive substances generally, in reality changing them at will from fulminates to simple explosives. —3 *A, August* 19, 128.

NEW SITE FOR THE BRITISH MUSEUM.

Our naturalist readers will be interested to learn that a definite movement has at last been made by the British government for the separation of the natural history from the literary department of the British Museum. In view of the enormous accumulation of specimens in that world-renowned establishment, rendering it impossible to exhibit more than a very small fraction to advantage in the buildings at present occupied by it, this move has been urged over and over again, and finally with success. A plot of ground, sixteen and a half acres in extent, formerly occupied by the International Exhibition of 1851, has been selected. This was originally sold to the British government for \$35,000 an acre; but, from its increase in value since that time, it is now estimated to be worth about \$1,200,000. The buildings to be first erected are to occupy four acres, the cost to be about \$1,700,000; and a small grant has been asked for the present year for the purpose of clearing the ground preliminary to future operations. It is possible that the proposed new museum of patents will be erected on the same plot, although this has not yet been decided upon positively.—12 *A, August* 4, 281.

NEW BUILDINGS FOR THE BRITISH MUSEUM.

The announcement of the intention on the part of the British government to provide new buildings for the accommodation of the immense natural history collection now forming part of the British Museum has interested the English naturalists in regard to the best method of arranging and displaying the specimens, both for the benefit of men of science and special students, as well as of the general public. Among other communications, an important one was presented by Dr. P. L. Sclater, the well-known secretary of the Zoological Society of London, and a naturalist of great eminence, which

formed the subject of an animated discussion at the late meeting of the British Association. The conclusions of Dr. Sclater's paper are enunciated in the following propositions, as summed up by himself:

1. The administration of the new museum of natural history should be vested in a director, who should be immediately responsible to one of the Queen's ministers.

2. The collections should be primarily divided into two series: (*a*) those intended for public exhibition; (*b*) those reserved for private study.

3. The collections *a* (for public exhibition) should be arranged in their natural order, in one continuous series of galleries, so as to give the best possible general idea of the principal forms of life, and of their arrangement according to the natural system.

4. The collections *b* (for private study) should be arranged in rooms immediately adjacent to the public galleries, in such a manner that the corresponding portions of *a* and *b* should practically form but one series, and so that the private student may have access at all times to objects in the public galleries.

5. A complete library of natural history should be furnished for the special use of the institution, and be placed in some central portion of the building, equally accessible to all departments.

6. The collections of osteology, the spirit preparations, the skins in store, the series of British animals, the collection of "nests and nidamental structures," and all other subordinate collections, should be amalgamated in the general series.

7. The collections of the palæontological department should likewise be amalgamated with the general series.

The views of Dr. Sclater in regard to the employment of a continuous system of wall-cases were stoutly contested, among others by Mr. Alfred Wallace and Professor Archer, the objections on the part of Mr. Wallace being that,

1. They admit of any object being seen by the smallest number of persons at once, so that any one person studying an object almost necessarily monopolizes it, and prevents others from approaching it, an inconvenience that reaches its maximum in the recessed cases exhibited in Dr. Sclater's plan.

2. Objects in wall-cases can be seen only on *one* side, which, as *all* sides of natural objects require to be seen, would necessitate many specimens to do the duty of one.

3. The observer on one side, from which alone he can see an object, will generally stand in his own light, and will often have distinct vision further impaired by reflection from the glass.

4. When small objects occur alternately with large ones a great waste of space results, and the attention is distracted from the less conspicuous object.

5. The use of wall-cases on one side of a gallery for an entire museum is an expensive and wasteful mode of arrangement.

Professor Archer indorsed the statements of Mr. Wallace, and remarked that, in his opinion, the best use of wall space is for purposes of illustration, but he does not consider it at all adapted for a large number of objects of natural history. He indicated his preference for the plan adopted for the South Kensington Museum, of having a succession of detached cases, each complete in itself, and inclosed in glass, and adapted for the reception and exhibition of a special group of forms, different sizes of these cases being so arranged as to admit of the varying dimensions of the sections to be exhibited. The paper of Dr. Sclater, and the discussion following it, may be read with profit by all those who have public museums in charge, or who contemplate the erection of cases for the exhibition of specimens of natural history.—12 *A*, *October* 6, 458.

PROPOSED CONNECTION OF SCIENCE AND THE BRITISH GOVERNMENT.

Colonel Strange, in view of the want of harmony between the British government and the learned men of the country upon scientific questions, suggests that two additions be made to the ministry; first, a Minister of Science, and, second, a permanent Consultative Council, to advise the various departments through the minister.

The duties of the council would be, first, to advise the government on all questions arising in the ordinary routine of administration submitted to it by the various departments; second, to advise government on special questions,

such as the founding of new scientific institutions, and the modification or abolition of old ones, the sanctioning of scientific expeditions, and applications for grants for scientific purposes; third, to consider and decide upon inventions tendered to government for the use of the state; and, fourth, to conduct or superintend the experiments necessary to enable it to perform these duties.—15 *A*, *August* 19, 240.

WOLLASTON GOLD MEDAL.

The Wollaston gold medal of the Geological Society of London has been presented to Professor Ramsey for his researches in practical and in theoretical geology. The remainder of the proceeds of the Wollaston donation fund were given to Mr. Robert Etheridge in aid of his great catalogue of British fossils. The success with which the band of working palæontologists in England has prosecuted its labors in determining the ancient fauna and flora of the island may be inferred from the statement that, while of recent species belonging to the animal and vegetable kingdoms less than 4000 are enumerated, 12,000 kinds of fossils have been described. The difference between the two is most preponderating among the mollusca, where we find over 7000 fossil species, and only about 600 recent. Among the reptiles there are 15 living species and 224 fossil.—12 *A*, *March* 2, 358.

ALLEN THOMSON ON THE "PSYCHIC FORCE."

Professor Allen Thomson, in his opening address before the Section of Biology of the British Association, of which he is chairman, takes occasion to enter his protest against the consideration of the phenomena of spiritualism by scientific men, instead of following Dr. Sharpey and Mr. Faraday in ignoring the subject. In this, although no names are mentioned, reference is evidently made to the paper of Mr. Crookes upon the phenomena exhibited by D. D. Home, which has excited so much attention of late among scientific circles.—15 *A*, *August* 12, 212.

PHENOMENON SEEN ON TEARING COTTON OR MUSLIN.

According to Mr. Andrew Pritchard, when a piece of new muslin is torn in the dark, a line of light is observable along the torn edges. It is not known whether this arises from

electricity or phosphorescence; but it seems to depend upon the dressing of the cloth, since after being washed the phenomenon does not manifest itself. A piece of stout twilled new cotton is said to furnish the best subject of experiment. —18 *A*, *November* 4, 168.

"ARCHIVES OF SCIENCE."

We welcome to the ranks of scientific journals *The Archives of Science and Transactions of the Orleans Society of Natural Science*, the second number of which, for January, 1871, a well-printed octavo of thirty-two pages, is now before us. Several original papers are embraced in this number; among them, one on the General Botany of Vermont, one on the Geology and Mineralogy of Orleans County, one upon the Dust Storms in Vermont of February 12, 1870, and four upon the flowerless plants of Vermont. This last paper is by Charles C. Frost, of Brattleboro', whose life furnishes a remarkable instance of the "pursuit of knowledge under difficulties." The writer well remembers, many years ago, stopping in a shoe-maker's shop in Brattleboro', Vermont, for the purpose of having a pair of boots mended, and finding the owner busily engaged on his beneh. A counter near by was littered with books, which he had the curiosity to examine, and which were found to be works in the Latin, German, Swedish, and other languages, all constituting a collection of the best treatises upon cryptogamic botany. On making inquiry, he ascertained that the shoe-maker was employing his leisure moments, when customers were few or work was completed, in the critical study of the fungi and other cryptogamous plants of the state, and that he was able to consult all the works referred to in their various languages. For the use of the books he was indebted to Mr. Sprague, of Boston, himself an eminent botanist, and interested in the scientific advancement of his Brattleboro' friend. Since then Mr. Frost has continued his researches, and is now well known as among the best specialists in this department in the country, and as one of the leading naturalists of the state.

DISASTER TO WHALERS IN THE ARCTIC SEAS.

Telegraphic advices from the West bring the news of a serious disaster to the whaling fleet of the Arctic Seas, no

less than thirty-three vessels having been destroyed, valued, with their cargoes, at a million and a half of dollars. Fortunately no lives were lost, although much suffering was experienced in consequence of the crowded quarters in which the crews of the vessels were obliged to huddle themselves. According to the reports brought in, the entire fleet had been working northward, with varying success, and in considerable numbers, in Behring Sea, and followed the whales into the Arctic Ocean, where fair success was met with, until about the 1st of September, when the ice came driving down, and in the course of a week or two a number of vessels were sunk, and others crushed by the ice or driven ashore. The catch destroyed amounted to 13,065 barrels of whale-oil, and 965 barrels of sperm, and 100,000 pounds of bone. Most of the vessels were owned in New Bedford, where the loss will be keenly felt.—*Daily paper.*

COMMISSIONER OF FISHERIES.

The states of Maryland and Virginia are at present at loggerheads as to which of them shall control the fishing of the Potomac River, which separates them, each having enacted laws on this subject, and being now engaged in an endeavor to enforce them. Several petitions have lately been presented to Congress requesting its interference by assuming the jurisdiction, which the petitioners consider properly the right of the United States to exercise, and to establish such regulations as may result in a final settlement of the whole question. In connection with this subject, we may remark that a bill is now pending in the Legislature of Virginia providing for the appointment of two persons as Commissioners of Fish and Fisheries, to investigate the methods adopted in other states and abroad for the artificial naturalization of fish, and of replenishing the streams of the state with the best varieties adapted to the purpose. Maryland, we believe, has already made a similar provision; so that now all the New England and Middle States (with, perhaps, the exception of Delaware), together with Maryland and Virginia, have appointed commissioners to take charge of this important branch of domestic economy. We have already referred to the appointment by the United States of a Commissioner of Fish and Fisheries, so that by the co-operation of these gentlemen we trust

that some definite system of action may be determined upon and presented to their respective constituencies for adoption.

FISHING STEAMER.

A form of steamer has lately been devised in England for the special purpose of employment in sea fishing, the advantages claimed being absolute safety; capacity for carrying considerable quantities of stores, with no splash of water from paddles or screws to disturb the fish; the power of steaming at a very slow speed while fishing; a low and perfectly clear free-board, so that nets and ropes can be passed all around the vessel, there being no shrouds, spars, rudder, or other external obstruction whatever; the vessel being double-ended, so as to avoid having to turn in port. The hull possesses great stability and steadiness, and can be made to contain suitable provision for wells for keeping fish alive till they can be sent to market.—2 *A*, *January* 7, 1871, 5.

SCIENTIFIC INACTIVITY IN GREAT BRITAIN.

Dr. Frankland, in a late number of *Nature*, makes an unfavorable comparison between the scientific activity of Great Britain and Germany as far as chemistry is concerned. He remarks that in 1866 there were published 1273 papers on new discoveries by 805 chemists—an average of 1.58 to each investigator. Of these, Germany contributed 445 authors and 777 papers, being considerably more than one half, or 1.75 to each author. France furnished 170 authors and 245 papers, or 1.44 to each author; while the United Kingdom supplied only 97 authors and 127 papers, or 1.31 papers to each author, the proportion from all other countries consisting of 93 authors and 124 papers, or 1.33 to each author. It is not stated what number of these were American. He furthermore remarks that the showing is still worse when we bear in mind the fact that a large number of papers credited to the United Kingdom are really the work of chemists born and educated in Germany. The causes of this low condition of chemical activity, shared also by other branches of science, he finds to be in the want of suitable buildings and apparatus for the prosecution of chemical investigations, and in the non-recognition of experimental research by any of the English universities.—12 *A*, *April* 6, 1871, 445.

REMOVAL OF TATTOO MARKS FROM THE SKIN.

Inquiry is frequently made for methods for the successful removal of tattoo marks in the skin. While these are generally asserted to be indelible if produced by the insertion of some carbonaceous matter, a correspondent of the *Chemical News* says that, in one attempt, the marks disappeared after being first well rubbed with a salve of pure acetic acid and lard, then with a solution of potash, and finally with hydrochloric acid. For further details the inquirer is referred to Casper's "Hand-Book of Forensic Medicine," vol. i., p. 108. —1 *A*, *March* 24, 1871, 143.

INTERNATIONAL EXCHANGES OF HOLLAND.

As is well known to many of our readers, the Smithsonian Institution, for a number of years past, has conducted a very extended system of international exchanges, by means of which all the scientific establishments in America have been kept in communication with sister institutions abroad, with no trouble and no expense to themselves beyond that attendant upon the delivery at Washington of the packages to be forwarded. At the present time it is understood that by far the greatest percentage of material interchanged between the two worlds passes through the hands of the Smithsonian, the packages being sent to different agents abroad and distributed by them, who, in turn, receive and transmit to Washington the returns from foreign countries.

Quite recently the learned societies and public libraries of Holland have undertaken to co-operate with the Institution in this enterprise by forming a Central Scientific Bureau of the Netherlands, at which the packages intended for transmission to America are to be collected, and forwarded from time to time to the Smithsonian Institution, which will distribute them to the parties addressed. The Bureau also proposes to establish special agencies in different parts of Europe, and has already announced the firm of Mr. J. B. Bailliere and Son, of Paris, as the agents for France, to whom all French institutions are requested to address such copies of their works as may be intended for the Netherlands.—3 *B*, *August* 3, 1871, 16.

RETURN OF MR. GWYN JEFFREYS TO ENGLAND.

The safe return of Mr. Gwyn Jeffreys from his visit to North America is mentioned in the English papers, with some account of his experiences, which were extremely pleasant to him. Every facility was given to him by the naturalists of this country for the examination of their collections, or those in their charge, and free permission was given him to carry back with him for study any specimens desired for that purpose. Quite fortunately, this has been the means of preserving a number of them to science, since, among the collections belonging to the Smithsonian Institution and the Museum of Comparative Zoology of Cambridge, as well as to the Academy of Sciences at Chicago, some of the more valuable types of the mollusca lent to Mr. Jeffreys had scarcely been removed from the city by him before the remainder of the collections, then in charge of Dr. Stimpson, were destroyed by the Chicago fire.

CELEBRATION OF THE 400th BIRTHDAY OF COPERNICUS.

The society of the friends of science in Posen proposes, on the 19th of February, 1873, to celebrate the 400th birthday of the eminent astronomer, Nicholas Copernicus, at his birthplace in the village of Thorne. In addition to the festivities of the occasion, they propose to publish an accurate biography of their countryman, and to prepare a monumental album, as also to strike an appropriate medal. A prize of 500 thalers is offered for the best biography that can be prepared before the 1st of January, 1872, to be based only upon authentic documents.—7 *C*, 1871, 570.

CROOKES ON PSYCHIC FORCE.

Mr. William Crookes, F.R.S., publishes in the October number of *The Quarterly Journal of Science* (London) a fresh series of experiments on the so-called "psychic force," mostly performed in the presence of the well-known "spiritualistic medium," Mr. D. D. Home. Mr. Crookes states that "these experiments confirm beyond doubt the conclusions at which he arrived in his former paper (published in the July number of the same journal), namely, the existence of a force associated in some manner not yet explained with the human organiza-

tion, by which force increased weight is capable of being imparted to solid bodies without physical contact." Mr. Crookes believes that this force is possessed by all human beings, although he has witnessed its exhibition in the case of but very few. Mr. Crookes's previous account had not been received with great favor by the scientific world in England, the Royal Society and the British Association having both declined to take up the subject.

DESTRUCTION OF THE CHICAGO ACADEMY OF SCIENCES BY THE FIRE.

Among the disastrous results of the recent fire at Chicago, one not referred to in the public papers was the entire destruction of the building and collections of the Academy of Sciences of that city. This institution, first started by the energy of the late Robert Kennicott, Esq., and carried to its late condition of prosperity under the charge of Dr. William Stimpson, had already taken a front rank among the learned establishments of the country. Its publications embraced material of the utmost value, while its museum ranked at least as high as the fifth in the United States. Although believed to be fire-proof, the building, like others of the same character in Chicago, presented but little resistance to the flames, and every thing within the walls was destroyed. The loss included, besides the collections in natural history of the Academy, a large number of marine invertebrates belonging to the Smithsonian Institution, which had been forwarded to Dr. Stimpson for investigation. The private cabinet of this gentleman, and a large mass of valuable manuscript belonging to him, embracing extended memoirs upon the mollusca, radiata, and crustacea of North America, with numerous illustrations, were entirely destroyed.

NEW AQUARIUM AT THE CRYSTAL PALACE AT SYDENHAM.

The aquarium at the Crystal Palace at Sydenham, near London, is now in full working order, under the management of Mr. W. A. Lloyd. The ground occupied by the aquarium and its adjuncts is nearly 600 feet long and 700 feet broad. The sea-water reservoir contains 80,000 gallons, and the fresh water tanks 20,000 gallons, in all 100,000 gallons, weighing 1,000,000 pounds. The main aeration of the water is effected

by mechanical agitation, and by the growth of sea-weeds on the rocks. The animals at present in the aquarium are sea anemones (about twelve species and 3000 individuals), tube-worms (four species), star fishes (three species), sea urchins, lobsters, crawfish, edible crabs, spider-crabs, swimming crabs, and various other crabs, prawn (two species), barnacles, oysters, mussels, cockles, scallops, whelks, periwinkles, dogwinkles, topes, cuttles (two species), skates, angel fish, lunce, pipe-fish, lumpfish, sucking fish, sole, plaice, cod, whiting pout, whiting, rockling, wrasse (four species), goby (three species), blenny (three species), dragonet, gunnel, gray mullet, sea bream, sea scorpion (two species), pogge, gurnard, weaver, bass, and many other species of fish. A few of the animals consume green sea-weed, but the food of by far the larger number is animal, consisting of shrimps (alive or dead), crabs, mussels, oysters, and fish, but never butcher-meat. A full and very interesting account of this magnificent object, with drawings, appears in *Nature* for October 12.

ILLUSTRATION OF PSYCHIC FORCE.

A correspondent of *Les Mondes*, writing in reference to the communications which have appeared in regard to the "psychic force," narrates a curious fact as coming within his own experience. He states that a favorite dog had been in the habit of taking up his abode upon a skin of a white bear in his master's chamber. On one occasion, while the dog was reclining upon the skin, the writer looking at him and admiring the entire confidence with which he rested his head upon the skin of this polar monster, the thought suddenly came into his mind as to the effect that would be produced upon the dog if it were a real bear, and not a mere skin. In a flash the dog gave a sudden bound, and got as far off the skin as possible, his ears erect and hair standing on end, with his mouth open, and exhibiting the utmost anxiety and terror. It was a long time before the animal could be induced to approach the skin and recline upon it as before, several days elapsing before this could be brought about!—3.*B*, xxv., *August* 10, 107.

O. NECROLOGY.

The following list embraces the principal losses by death in the ranks of scientific men during the year 1871.

Babbage, Mr. Charles. A mathematician of eminence; was the inventor of a calculating machine; contributed many papers to scientific journals; the author of one of the celebrated series of "Bridgewater Treatises." Died October 20th, in his seventy-ninth year.

Barton, Dr. J. R. An eminent surgeon. Died January 1st, at Philadelphia.

Basevi, Captain. Royal Engineers; deputy superintendent of the Trigonometrical Survey of India.

Chauvenet, Professor William. An eminent mathematician and astronomer. At one time connected with the Naval Academy at Annapolis, and subsequently Chancellor of Washington University, St. Louis. Died at St. Paul, Minnesota, December 13th, in his fifty-first year.

Claparède, Edouard. A native of Switzerland; author of valuable papers upon the infusoria, the marine worms of the Hebrides and of the shores of the Mediterranean, and many other highly-prized treatises upon different branches of natural history. Died at the age of thirty-nine.

Denny, Mr. Henry. Curator of the Leeds Philosophical and Literary Society for nearly fifty years; author of a work upon the lice of different species of animals. Died aged sixty-eight.

Duméril, Professor A. A. A well-known naturalist, and an author of many works upon reptiles and fishes; a member of the Institute of France and the Society of Acclimatation, and professor in the Natural History Museum of Paris. Died November 12th, at the age of fifty-eight.

Haidinger, Chevalier William. For many years at the head of the *Geologische Reichsanstalt* of Vienna; particularly interested in the collection of meteorites. Died at an advanced age.

Hartweg, C. T. Botanical collector in California, Mexico, and South America; director of the grand-ducal gardens at Swetzingen, Baden. Died February 3d.

Herschel, Sir John F. W. A distinguished astronomer and mathematician; author of a standard text-book on astronomy, and of many valuable philosophical works; master of the Mint; the recipient of many honors, medals, etc., in recognition of his merit as a man of science. Died May 12th, aged eighty-four.

Hincks, Rev. William. Professor of natural history in Queen's College, Cork, and in the University of Toronto; a writer of various articles upon the botany and geology of Canada.

Holbrook, Dr. John Edwards. A prominent naturalist; professor of anatomy in the State University of South Carolina; a well-known writer upon the reptiles of North America and the fishes of South Carolina. Died September 8th, at Norfolk, Massachusetts, at the age of seventy-seven.

Houdin, Robert. A renowned prestidigitator, and distinguished for his methods of turning electricity to practical account.

Knieskern, Dr. Peter D. An indefatigable collector of plants. Died at Shark River, New Jersey, September 12th, at the age of seventy-three.

Lambert, M. Gustave. An earnest projector of expeditions of Polar discovery by the way of Behring's Straits. Born July 1, 1824; died January 27, 1871, from a wound received in a skirmish with the German troops before Paris.

Lantzius-Beninga. A specialist in regard to the spore-cases of mosses. Died at Göttingen, March 6th.

Lartêt, Professor E. A zealous laborer in science, especially in connection with the pre-historie remains and the fossil mammalia of France. Died in Paris.

Lecoq, Mr. Henry. A botanist and geologist; a benefactor to his fellow-citizens as well as to science by his bequests in money and valuable collections. Died at Clermont-Ferrand, France.

Lenormand, Sebastian René. A well-known botanist. Died at Vire, December 11th, aged seventy-six.

Mahan, Professor Dennis. Professor of engineering at West Point. Died September 16th.

Martins, C. O. A. Born July, 1816, at Berlin. Died of small-pox, July, 1871. Well known as a member of the firm of Pistor and Martins, for the manufacture of first-class geodetic and astronomical instruments, among them the meridian circle used by Lieutenant Gillis in Chilé, and others for the observatories at Ann Arbor and Albany, and for the National Observatory at Washington (the last being the largest made by him).

Milde, Julius. Botanist; specialist in equisetaceæ and ferns. Died at Breslau, July 3d.

Miller, Dr. A well-known European cryptogamic botanist.

Miquel, Professor F. A. W. The leading botanist of the Netherlands, and director of the Herbarium at Leyden. Died January 23d, aged fifty-nine.

Morgan, Professor Augustus de. An eminent mathematician. Died in London.

Murchison, Sir Roderick I. Distinguished as a geographer and geologist; early an officer in the British army; a director of the Geological Survey of Great Britain and Ireland, and the head of the School of Mines in Jermyn Street. Died October 23d, at the age of seventy-nine.

Musprat, Dr. Sheridan. An eminent chemist, and author of works on chemistry. Died at Liverpool.

Olrick, Mr. Royal inspector of North Greenland; director of the colonies. Died at Copenhagen.

Payen, M. A well-known writer upon applied chemistry. Died in Paris, aged seventy-six.

Pease, Wm. Harper. An American, long time resident in the Sandwich Islands, and in communication with leading naturalists in America and Europe. Specially interested in conchology, and a describer of many new species. Died at Honolulu in July, 1871.

Reissek, S. Keeper of the Imperial Herbarium at Vienna. Died November 9th.

Rigacci, Jean. Well known as a conchologist. Died at Rome, May 11th, in his fifty-fifth year.

Rodman, U.S.A., Brigadier-General. An ordnance officer, inventor of the Rodman gun. Died at Little Rock, Arkansas, June 7th, aged fifty.

Rohrbach, Paul. A botanist of Berlin. Died June 3d, aged twenty-five.

Russel, Mr. Robert. An eminent Scottish meteorologist and agriculturist. Author of a work on American agriculture.

Sagra, Mr. Ramon de la. Author of a valuable work on the natural history of Cuba. Died in Switzerland, aged seventy-three.

Schultz-Schultzenstein, Professor Carl H. Professor of physiology at the University of Berlin. Died March 23d.

Seeman, Dr. Berthold. Botanist and explorer; author of valuable papers on "Plants of the Esquimaux Land," etc., and of various works of travel; editor of a botanical journal in London; a director of gold mines in Nicaragua, and manager of a sugar estate near Panama. Died near Chontales, Nicaragua, October 10th.

Sowerby, Mr. James de Carle. A well-known naturalist; a distinguished artist; especially prominent as a botanist; author of "Sowerby's English Botany." Died August 26th, aged eighty-four.

Strecker, Dr. Adolph. Professor of chemistry at Würzburg. Author of a text-book, and of other publications relative to chemistry.

Swan, Rev. J. A. An ardent naturalist; secretary of the Boston Society of Natural History. Died at Boston, October 31st, aged forty-eight.

Villavicencio, Dr. Manuel. Governor of a province of Ecuador; known as an author by his researches on the Quichua language, and a work on the geography of Ecuador. Died at Quito, January 11th.

Wetherell, Professor Charles M. Connected with the United States Agricultural Department for a time as a chemist, then with the Smithsonian Institution in a similar capacity, and finally professor of chemistry at Lehigh University, Bethlehem, Pennsylvania, where he died March 5th.

Wilson, William. Specialist in mosses; associated with Sir William Hooker in a work on British Mosses. Died April 3d, at Warrington, aged seventy-two.

P. INDEX TO THE REFERENCES.

In the large number of serial works regularly used in the preparation of material for the *Record*, it has been found expedient to adopt some mode of abbreviating the titles, so as to save both time and space in writing and printing them. For this purpose the different countries have been represented by letters, and the journals numbered as in the following table. Publications referred to only occasionally are indicated by abbreviations of their titles at the end of the articles. Where no references are made, it is to be understood that the article is partially or entirely original, and prepared by the editor or his collaborators; in some cases, however, that the quotation has been mislaid or overlooked.

A. *Great Britain.*

1. The Chemical News and Journal of Physical Science. Weekly. London.
2. Land and Water. Hunting, Shooting, Fishing, practical Natural History. Weekly. London.
3. The Mechanics' Magazine: an illustrated Journal of Science, Arts, and Manufactures. Weekly. London.
4. Hardwicke's Science Gossip. Monthly. London.
5. The Popular Science Review. Quarterly. London.
6. Public Opinion. Weekly. London.
7. London, Edinburg, and Dublin Philosophical Magazine. Monthly. London.
8. Scientific Review: Record of progress in Arts, Industry, and Manufactures; and Journal of the Inventors' Institute. Monthly. London.
9. The Student and Intellectual Observer of Science, Literature, and Art. Quarterly. London.
10. The Annals and Magazine of Natural History. Monthly. London.
11. Proceedings of the Scientific Meetings of the Zoological Society of London. London.
12. Nature: a weekly illustrated Journal of Science. London.
13. The Academy: a Record of Literature, Learning, Science, and Art. Semi-monthly. London.
14. The Pharmaceutical Journal and Transactions of the Pharmaceutical Society. Weekly. London.
15. The Athenæum: Journal of English and Foreign Literature, Science, and Fine Arts, Music, and the Drama. Weekly. London.

16. The Quarterly Journal of Science, and Annals of Mining, Metallurgy, Engineering, industrial Arts, Manufactures, and Technology. London.

17. The Journal of Applied Science: a monthly record of progress in the industrial Arts. London.

18. English Mechanic and World of Science. With which are incorporated "The Mechanic," "Scientific Opinion," and the "British and Foreign Mechanic." Weekly. London.

19. The Field, the Farm, the Garden: the Country Gentleman's Newspaper. Folio. Weekly. London.

20. Medical Times and Gazette. Weekly. London.

21. Journal of the Chemical Society, containing the papers read before the Society, and abstracts of Chemical papers published in other journals. Monthly. London.

B. *France.*

1. Bulletin hebdomadaire de l'Association Scientifique de France. Weekly. Paris.

2. Cosmos. Weekly. Paris.

3. Les Mondes: revue hebdomadaire des Sciences et de leurs applications aux Arts et a l'Industrie. Weekly. Paris.

4. Le Moniteur Scientifique du Dr. Quesneville. Journal des Sciences pures et appliquées. Bi-monthly. Paris.

5. Le Technologiste, ou Archives des progrés de l'industrie française et étrangère. Monthly. Paris.

6. Comptes rendus hebdomadaires des séances de l'Académie des Sciences. Weekly. Paris.

7. Science pour tous. Weekly. Paris.

8. Revue Scientifique. Weekly. Paris.

C. *Germany and Austria.*

1. Aus der Natur. Die neuesten Entdeckungen auf dem Gebiete der Naturwissenschaften. Weekly. Leipsic.

2. Archiv der Pharmacie. Monthly. Halle.

3. Das Ausland. Ueberschau der neuesten Forschungen auf dem Gebiete der Natur- Erd- und Volkerkunde. Weekly. Augsburg.

4. Badische Gewerbzeitung für Haus und Familie. Monthly. Karlsruhe.

5. Deutsche illustrirte Gewerbezeitung. Weekly. Berlin.

6. Deutsche Industrie-Zeitung: Organ der Handels- und Gewerbekammern zu Chemnitz, etc. Weekly. Dresden.

7. Gaea. Natur und Leben. Zeitschrift zur Verbreitung und Hebung naturwissenschaftlicher, geographischer, und technischer Kenntnisse. Monthly. Koln und Leipsic.

8. Industrie-Blatter: Wochenschrift für Fortschritt und Aufklarung in Gewerbe, Hauswirthschaft, Gesundheitspflege, etc. Weekly. Berlin.

9. Kurze Berichte über die neuesten Erfindungen, Entdeckungen und Verbesserungen im Gebiete des Gewerbwesens, des Handels und der Landwirthschaft. Monthly. Mannheim.

10. Landwirthschaft und Industrie; Monatsschrift für Landwirthe, Fabrikanten und Geschäftsleute jeder Art. Monthly. Berlin.

11. Die neuesten Erfindungen im Gebiete der Landwirthschaft, der Bergbaues, der Fabriks und Gewerbwesens und des Handels. Illustrirte Zeitschrift. Semi-monthly. Vienna.

12. Oberlausitzer Gewerbeblatt. Organ der Gewerbe- und Handwerker-Vereine des Konigreichs Sachsen. Semi-monthly. Bautzen.

13. Polytechnisches Centralblatt. Semi-monthly. Leipsic.

14. Polytechnisches Journal, etc. Dr. E. M. Dingler. Semi-monthly. Augsburg.

15. Polytechnisches Notizblatt für Gewerbtreibende Fabricanten und Künstler. Bi-monthly. Mainz.

16. Blätter für Gewerbe, Technik, und Industrie. Leipsic.

17. Mittheilungen aus Justus Perthes geographischer Anstalt über wichtige neue Erforschungen auf dem Gesammtgebiete der Geographie. Dr. A. Petermann. Monthly. Gotha.

18. Chemisches Central-Blatt. Repertorium für reine, pharmaceutische, physiologische, und technische Chemie. Weekly. Leipsic.

19. Der Naturforscher. Wochenblatt zur Verbreitung der Fortschritte in den Naturwissenschaften. Weekly. Berlin.

21. Neues Jahrbuch für Pharmacie. Monthly. Heidelberg.

22. Landwirthschaftliches Centralblatt für Deutschland. Monthly. Berlin.

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